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Analysis of factors influencing farmers' use of indigenous/local climate change adaptation strategies in southern Taraba State, Nigeria

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Abstract

This study examined the factors influencing farmers' use of indigenous/local climate change adaptation strategies in Southern Taraba State, Nigeria. The specific objectives were to describe the socio-economic characteristics of farmers and to analyze the factors influencing their adoption of indigenous/local climate change adaptation strategies. Primary data were collected from 343 farmers using structured questionnaires, selected through a multi-stage sampling technique. Descriptive statistics were used to profile the socio-economic characteristics of farmers, while binary logistic regression was employed to identify determinants of indigenous strategy adoption. The results show that the majority of respondents were male (63.27%), married (60.64%), and had an average farming experience of 9 years. Eight factors were found to significantly influence adoption: age, farming experience, educational level, cooperative membership, access to extension services, access to climate information, perceived effectiveness of indigenous practices, and access to credit. The study concludes that indigenous knowledge remains a vital component of climate resilience but requires supportive institutional and financial frameworks to enhance its effectiveness. Policy interventions should strengthen extension services, promote cooperative societies, improve access to credit, and integrate indigenous knowledge into formal agricultural and climate adaptation programmes. These measures will enhance farmers' adaptive capacity, preserve valuable local knowledge, and contribute to sustainable agricultural productivity in the face of climate change.

Keywords: Indigenous Knowledge; Climate Change Adaptation; Taraba State; Nigeria

1. Introduction

Climate change remains an existential threat to agricultural systems across sub-Saharan Africa, with Nigeria exhibiting pronounced vulnerability owing to its heavy dependence on rain-fed agriculture, limited adaptive capacity, and escalating food insecurity challenges (IPCC, 2021; Serdeczny et al., 2017). The nation's agricultural sector, which sustains approximately 70% of rural households, confronts increasingly erratic rainfall patterns, rising ambient temperatures, heightened frequency of drought and flood events, and consequent declines in crop productivity (Nwankwoala, 2015; Ogunbiyi et al., 2021). Recent empirical evidence confirms that yam farmers in North-Central Nigeria identify climate-induced spoilage and accelerated weed proliferation as primary production constraints, while crop farmers across southwestern Nigeria overwhelmingly report erratic rainfall regimes and unusual early rains followed by prolonged dry spells as defining features of contemporary climate variability (Olorunsola et al., 2025). Within this context of accelerating biophysical change, the imperative for effective, accessible, and context-appropriate adaptation strategies has never been more urgent.

While conventional climate adaptation discourse has historically privileged exogenous, science-based technological interventions, a substantial and growing body of contemporary scholarship recognises the enduring relevance, efficacy, and resilience of indigenous and local knowledge systems in climate risk management (Bamigboye et al., 2025; Malabe & Mustapha, 2025). Indigenous adaptation strategies constitute a diverse repertoire of practices refined through

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generations of experiential learning and intergenerational transmission. These include the utilisation of agroecological indicators for seasonal forecasting notably the chirping of crickets, appearance of cattle egrets, congregation of ant colonies, and emergence of flying termites alongside crop diversification, mulching, intercropping, cultivation of drought-tolerant local varieties, agroforestry systems, and various soil and water conservation techniques (Bamigboye et al., 2025; Agboola et al., 2024; Ifeanyi-Obi et al., 2017). Pastoralist communities in northern Nigeria similarly deploy traditional coping mechanisms developed over countless generations to navigate climate-induced environmental stress (Idoma et al., 2016). These locally-evolved strategies confer distinct advantages: they are readily accessible, culturally embedded, economically affordable, socially legitimate, and frequently constitute farmers' first line of defence against climatic perturbations (Egeru, 2012; Mapfumo et al., 2016; Popoola et al., 2020).

However, the utilisation of indigenous climate adaptation strategies is neither uniform nor automatic across Nigeria's diverse agroecological and sociocultural landscapes. A complex constellation of socioeconomic, demographic, institutional, and cultural factors systematically shapes farmers' awareness, selection, and intensity of adoption of these practices (Adeagbo et al., 2023). Recent studies employing multinomial logit and probit regression analyses have identified farmers' educational attainment, land ownership status, farm size, access to credit, exposure to extension services, and participation in training programmes as statistically significant determinants of indigenous climate adaptation strategy utilisation (Adeagbo et al., 2023; Ojo et al., 2021; Bamigboye et al., 2025). Concurrently, formidable constraints persist across multiple geopolitical zones. Insufficient documentation and codification of indigenous knowledge reported by 98.8% of crop farmers in Osun State severely limits its preservation and transmission (Agboola et al., 2024). Limited intergenerational transfer, with 96.2% of farmers citing inadequate support from younger generations, portends the progressive erosion of this knowledge capital (Agboola et al., 2024). Policy environments that systematically privilege external technologies over endogenous innovations, institutional barriers to knowledge integration, and the hegemonic privileging of Western scientific paradigms in agricultural development discourse further marginalise indigenous knowledge systems (Adebo & Ajayi, 2020; Inkani et al., 2025; Oluwatimilehin & Ayanlade, 2021). The main objective of this study is to examine factors influencing farmers' use of indigenous/local climate change adaptation strategies in southern Taraba State, Nigeria. The specific objectives are to:

- describe the socio-economic characteristics of farmers in the study area; and
- analyze the factors influencing farmers' use of indigenous/local climate change adaptation strategies; and

2. Methodology

2.1. The Study Area

This study was conducted in Southern Taraba State, a sub-region of Taraba State located in the northeastern part of Nigeria. Geographically, the southern zone lies approximately between latitude 6°30' and 7°30' North and longitude 10°00' and 11°30' East. The southern part of the state shares an international boundary with the Republic of Cameroon to the southeast, and domestic boundaries with Benue and Cross River States to the south and southwest. The Local Government Areas in this zone include Takum, Donga, Ussa, Wukari, and Ibi, which make up the Taraba South Senatorial District.

Southern Taraba is characterized by rich biodiversity, lush vegetation, and favourable climatic conditions for agriculture. The area falls within the Southern Guinea Savanna and Forest-Savanna zone, receiving annual rainfall ranging from 1,200 mm to 2,000 mm, with the wet season typically running from April to October. Temperatures average between 20°C and 32°C, with cooler conditions experienced in the highland areas such as parts of Takum and Ussa Local Government Area (National Meteorological Agency (NIMET), 2021). These ecological conditions support the cultivation of both food and cash crops, including yam, cassava, maize, rice, soybean, and groundnut, as well as tree crops like citrus, mango, palm, and banana (Adewuyi & Bamidele, 2022).

Agriculture remains the dominant economic activity in Southern Taraba, with the majority of the population engaged in farming, fishing, and livestock rearing (Usman et al., 2023). The region is known for its ethnic diversity, being home to several ethnic groups including the Jukun, Kuteb, Chamba, Tiv and Ichen, each possessing rich indigenous knowledge systems and unique adaptation strategies to climate change (Nwankwo et al., 2020). The high level of cultural plurality has historically contributed to robust community-based resource management practices and knowledge-sharing mechanisms, particularly in agriculture and environmental conservation.

Southern Taraba is moderately developed in terms of infrastructure, with access to local markets, road networks, electricity, schools, health facilities, and financial services. However, road conditions during the rainy season can become challenging, affecting transportation and market access for farm produce. Despite these limitations, the region

plays a vital role in Taraba State's agricultural productivity and is considered a key contributor to food security in the region (Ahmed et al., 2021).

2.2. Source and Methods of Data Collection

Primary data were used for the purpose of this study. This was obtained by the use of structured questionnaire which was administered to farmers in the study area. The other sources of information consist of records from Taraba State Agriculture Development Programme (TADP)

2.3. Sampling procedure

A multi-stage and purposive sampling technique was employed in selecting the farmers for the study. Firstly, three (3) Local Government Areas (Wukari, Takum and Ussa) were selected out of the five (5) Local Government Areas in Southern Taraba State based on their high involvement in the use of indigenous/local climate change adaptation strategies in farming. In the second stage, three (3) wards were purposively selected from each of the chosen Local Government Areas, making a total of nine (9) wards. The third stage involve the random selection of three (3) villages from each of the selected wards, resulting in a total of twenty-seven (27) villages for the study. In the fourth stage, a simple random sampling technique was used to select 352 respondents from a population size of 2,965 farmers, using Yamane's formula as shown below, and only 343 questionnaire were return with usefully information

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

Where

N = Sample sizes

N = Number of farmers (sampling frame)

e = Margin error (usually 5%)

3. Methods of Data Analysis

Descriptive and inferential statistics were employed in the analysis of the data.

3.1. Descriptive analysis

Descriptive analysis involve the use of means, frequencies, and percentages was use to describe the socio-economic characteristics of the farmers.

3.2. Inferential statistics

A binary logistic regression model was employed to examine the factors influencing farmers' adoption of indigenous/local climate change adaptation strategies. The logistic model is appropriate because the dependent variable is dichotomous, taking the value of one when a farmer adopts at least one strategy and zero otherwise.

The model is specified as:

$$\text{Log} \left(\frac{p_i}{1-p_i} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_{11} X_{11}$$

Where;

P_i = probability that the i^{th} farmer adopts at least one indigenous/local adaptation strategy;

$1-P_i$ = probability that the farmer does not adopt any strategy;

$\text{Log} \left(\frac{p_i}{1-p_i} \right)$ = log-odds (logit) of adoption;

β_0 = intercept term

$\beta_1 - \beta_{10}$ = parameters to be estimated

X_1 = Age (years)

X_2 = Farming experience (years)

- X_3 = Educational level (years of schooling)
 X_4 = Membership of Cooperative Society (1= yes, otherwise = 0)
 X_5 = household size (number)
 X_6 = Farm size (hactares)
 X_7 = Access to extension service (1= yes, otherwise = 0)
 X_8 = Access to climate information (1= yes, otherwise = 0)
 X_9 = Cultural belief in tradition knowledge (1= yes, otherwise = 0)
 X_{10} = Perceived effectiveness of indigenous strategies (1= effective, 0 = not effective)
 X_{11} = Access Credit (access=1, No access=0)

4. Results and discussion

4.1. Socio-economic Characteristics of Farmers

The results of the socio-economic characteristics of farmers in (Table 1) shows that 63.27% of the respondents were male, while 36.73% were female, indicating male dominance in farming activities in the study area. Male farmers often have greater access to land, farm inputs, and decision-making power, which enhances their capacity to implement indigenous climate change adaptation strategies such as crop diversification and soil conservation. Female farmers, despite possessing valuable indigenous knowledge, may face constraints related to resource access. This finding is consistent with FAO (2021), which reported that gender disparities continue to shape access to resources and climate adaptation outcomes among smallholder farmers in sub-Saharan Africa. The majority of the farmers (41.98%) were within the age bracket of 31–40 years, with a mean age of 39 years. This suggests that most respondents were in their productive and economically active years. Farmers within this age range are more likely to combine physical strength with experiential knowledge in adopting indigenous adaptation strategies such as adjusting planting dates and using local drought-tolerant crop varieties. This finding aligns with Abid et al. (2020), who found that age significantly influences farmers' adaptive responses to climate variability.

The findings reveal that 60.64% of the respondents were married. Married farmers are often more inclined to adopt indigenous climate change adaptation strategies due to increased household responsibilities and the need to ensure food security. Family labour availability also supports labour-intensive traditional practices. This result supports Akinyemi and Ojo (2021), who observed that marital status positively affects farmers' engagement in climate change adaptation strategies in Nigeria. More than half of the respondents (52.19%) had household sizes of 6-10 persons, with a mean household size of 6. Larger households provide family labour necessary for implementing indigenous practices such as mulching, intercropping, and traditional soil management. However, large household sizes may also increase pressure on household resources. This finding agrees with Oyekale (2020), who reported that household size significantly influences the adoption of indigenous agricultural adaptation practices among smallholder farmers.

The results indicate that respondents had substantial farming experience, with a mean of 9 years. Long years of farming experience enhance farmers' understanding of local climatic patterns and strengthen reliance on indigenous knowledge for coping with climate variability. Experienced farmers are more likely to recognize climate risks early and apply traditional adaptation strategies. This finding corroborates Etana et al. (2021), who found that farming experience positively influences climate change adaptation among smallholder farmers. The results show that 58.60% of the respondents had secondary education, while 17.20% attained tertiary education. Education improves farmers' ability to understand climate information and refine indigenous adaptation practices through informed decision-making. Educated farmers are better positioned to integrate traditional knowledge with improved techniques. This finding is in line with Akudugu and Alhassan (2022), who reported that education significantly enhances farmers' adaptive capacity to climate change.

The majority of the farmers (74.05%) relied on personal savings as their main source of finance. Dependence on personal savings indicates limited access to formal financial institutions, which may constrain the expansion or improvement of indigenous adaptation strategies. Financial limitations reduce farmers' ability to invest in climate-resilient inputs and tools. This finding supports Ogunleye et al. (2023), who found that limited financial resources restrict farmers' climate adaptation efforts in rural Nigeria. Only 25.36% of the respondents had access to credit, while 74.64% lacked access. Limited access to credit reduces farmers' capacity to strengthen and scale indigenous climate change adaptation strategies. Credit access enables farmers to invest in complementary practices that enhance resilience. This result is consistent with Issahaku and Abdulai (2020), who reported that access to credit significantly improves farmers' adaptation to climate change.

The findings reveal that 80.47% of the farmers had no access to extension services. Limited extension contact restricts farmers' exposure to improved climate information and opportunities to enhance indigenous adaptation practices. Extension services are crucial for integrating scientific climate knowledge with local practices. This finding aligns with Adebisi et al. (2024), who emphasized the role of agricultural extension services in strengthening farmers' climate change adaptation capacity. The results show that most respondents were smallholder farmers, with a mean farm size of 2 hectares. Small farm sizes encourage reliance on low-cost indigenous adaptation strategies such as mixed cropping and traditional soil fertility management. However, small landholdings may also limit diversification options. This finding supports Gbegbelegbe et al. (2022), who noted that smallholder farmers largely depend on indigenous strategies to cope with climate change impacts.

Table 1 Socio-economic Characteristics of the Farmers

Gender	Frequency	Percentage
Female	126	36.73
Male	217	63.27
Age		
≤ 20	3	0.87
21-30	94	27.41
31-40	144	41.98
41-50	77	22.45
≥ 50	25	7.29
Mean	39	
Marital Status		
Single	135	39.36
Married	208	60.64
Household Size		
1-5	91	26.53
6-10	179	52.19
11-15	44	12.83
≥ 16	29	8.45
Mean	6	
Experience (Years)		
1-5	47	13.70
6-10	128	37.32
11-15	93	27.11
16-20	51	14.87
≥ 21	24	7.00
Mean	9	
Level of Education		
No formal	22	6.41
Primary	61	17.78
Secondary	201	58.60

Tertiary	59	17.20
Sources of Finance		
Personal Savings	254	74.05
Borrowed	57	16.62
Friends and Relative	32	9.33
Access to Credit		
Access	87	25.36
No Access	256	74.64
Access to Extension Service		
Access	67	19.53
No Access	276	80.47
Farm Size (ha)		
<1 - 2	151	44.03
3 - 4	147	42.86
>4	45	13.12
Mean	2	

Source: Field Survey, 2025

4.2. Factors Influencing Farmers' Use of Indigenous/Local Climate Change Adaptation Strategies

The binary logistic regression model was employed to determine the factors influencing farmers' likelihood of adopting of indigenous or local climate change adaptation strategy in the study area (Table 2). The model's goodness-of-fit indicators show that it performed well, with a Likelihood Ratio (LR) chi-square of 125.95, which is statistically significant at the 1% level ($p < 0.01$). This implies that the set of explanatory variables included in the model jointly influence farmers' decisions to use indigenous adaptation practices. The Pseudo R^2 value of 0.382 indicates that about 38% of the variation in the probability of adopting indigenous adaptation strategies is explained by the independent variables included in the model. Furthermore, the model correctly classified 86.01% of the sampled farmers, suggesting a high predictive accuracy. The mean Variance Inflation Factor (VIF) of 1.37 also indicates the absence of multicollinearity among the explanatory variables, meaning the estimates are stable and reliable.

The results show that eight variables were statistically significant in influencing farmers' adoption of indigenous/local climate change adaptation strategies and includes; age, farming experience, educational level, cooperative membership, access to extension services, access to climate information, perceived effectiveness of indigenous practices and access to credit.

Age ($\beta_1 = 0.063$, $p < 0.05$): Age was positively and significantly related to the adoption of indigenous adaptation strategies. This implies that as farmers grow older, they become more likely to adopt local strategies, possibly because older farmers possess more indigenous knowledge and experience in dealing with climatic variations. The odds ratio of 1.065 means that for every additional year of age, the likelihood of adopting indigenous strategies increases by about 6.5%. Ifeanyi-Obi *et al.* (2017) observed that older smallholder farmers in Nigeria were more likely to adopt indigenous strategies like mulching, mixed cropping, and early planting, attributing this to their deeper cultural connection with local knowledge systems

Farming Experience ($\beta_2 = 0.078$, $p < 0.01$): Farming experience had a positive and significant influence, suggesting that experienced farmers are better positioned to understand and implement traditional coping mechanisms developed over time. The odds ratio of 1.081 indicates that an additional year of farming experience raises the likelihood of adopting indigenous strategies by approximately 8%. Mengistu (2024) observed that farmers with longer years of farming experience in Ethiopia were more likely to utilise indigenous and traditional coping mechanisms, as experience enhances their ability to interpret climatic signals and respond appropriately. Similarly, Magesa *et al.* (2023) reported that farming experience significantly increases the likelihood of adopting local adaptation practices because experienced farmers often rely on practical knowledge accumulated over time rather than external advice

Educational Level ($\beta_3 = 0.100$, $p < 0.01$): Education was found to significantly enhance the adoption of indigenous strategies. Educated farmers are likely to appreciate the relevance of traditional practices while also being open to improving them through new information. The odds ratio (1.106) suggests that each additional year of schooling increases the likelihood of adoption by about 10.6%. Ayanlade *et al.* (2023) reported that education enhances farmers' analytical capacity and openness to innovation, which enables them to modify indigenous techniques based on scientific information and changing climatic realities

Cooperative Membership ($\beta_4 = 1.528$, $p < 0.01$): Membership in cooperative societies had a strong and positive effect on the probability of adopting indigenous adaptation methods. Farmers who belong to cooperatives are 4.6 times more likely to use local strategies compared to non-members. This reflects the importance of farmer-based organisations in facilitating knowledge sharing and collective problem-solving concerning climate challenges. Aniah *et al.* (2023) observed that cooperative associations provide social capital that enables farmers to access traditional and scientific knowledge about climate adaptation, thereby increasing their resilience to climate risks. Similarly, Hassan *et al.* (2022) found that membership in agricultural cooperatives significantly improved farmers' capacity to adopt both indigenous and modern adaptation practices, largely because cooperatives serve as channels for disseminating context-specific information and fostering collective problem-solving.

Table 2 Factors Influencing Farmers' Use of Indigenous/Local Climate Change Adaptation Strategies

Variables	Parameters	Coefficient	Standard Errors	Z	Odds Ratio
Age (X_1)	β_1	0.063**	0.030	2.09	1.065
Farming experience (X_2)	β_2	0.078***	0.025	3.16	1.081
Educational level (X_3)	β_3	0.100***	0.033	3.06	1.106
Cooperative member (X_4)	β_4	1.528***	0.405	3.77	4.608
Household size (X_5)	β_5	-0.011	0.086	-0.13	0.990
Farm size (X_6)	β_6	0.090	0.110	0.82	1.096
Extension access (X_7)	β_7	1.326**	0.456	2.90	3.764
Climate information access (X_8)	β_8	1.046**	0.406	2.57	2.846
Cultural belief (X_9)	β_9	0.087	0.382	0.23	1.091
Perceived effective (X_{10})	β_{10}	1.619***	0.399	4.06	5.048
Credit access (X_{11})	β_{11}	1.223**	0.478	2.56	3.399
Constant		-6.003***	1.128	-5.32	0.002
LR chi2(11) = 125.95					
Prob > chi2 = 0.0000					
Pseudo R2 = 0.382					
Log likelihood = -102.09218					
Number of obs = 343					
Mean VIF= 1.37					
Correctly classified=86.01%					

Source: Field survey, 2025, NB: ***, **=significant at 1% and 5% probability levels

Access to Extension Services ($\beta_7 = 1.326$, $p < 0.05$): Access to agricultural extension services was also positively and significantly associated with indigenous strategy use. Farmers who received extension support were 3.76 times more likely to adopt local coping mechanisms, indicating that extension agents play a vital role in promoting awareness and integration of indigenous knowledge with modern practices. Farmers who have contact with extension personnel are often better informed about locally relevant coping practices and more confident in integrating them with modern innovations. Etwire *et al.* (2023) found that access to extension services significantly enhanced farmers' capacity to

identify, adapt, and refine indigenous climate adaptation techniques in Northern Ghana, as extension visits facilitate the dissemination of both indigenous and scientific information.

Access to Climate Information ($\beta_8 = 1.046, p < 0.05$): Access to climate-related information significantly increased the probability of using indigenous adaptation strategies. The odds ratio of 2.85 suggests that farmers with timely access to climate information are nearly three times more likely to apply local adaptation measures, likely due to better awareness and preparedness. This aligns with the findings of Ali and Egbetokun (2022) who reported that access to credible climate information through community radio and extension networks increased the likelihood of farmers using indigenous adaptation practices in Northern Nigeria, as information strengthened awareness, preparedness, and decision-making. This supports the current finding that farmers with access to climate information are nearly three times more likely to adopt indigenous strategies, reflecting the vital role of information flow in climate resilience and adaptive behaviour.

Perceived Effectiveness ($\beta_{10} = 1.619, p < 0.01$): Farmers who perceive indigenous strategies as effective were 5.05 times more likely to adopt them. This finding underlines the importance of perception and confidence in traditional methods when farmers believe that indigenous practices work, they are much more inclined to use them. This finding aligns with Munyua *et al.* (2023), who reported that perception of the effectiveness of indigenous methods strongly determined their continued use among smallholder farmers in Kenya, as trust and experiential success reinforced behavioural intention.

Access to Credit ($\beta_{11} = 1.224, p < 0.05$): Access to credit positively and significantly influenced adoption. Farmers with access to credit were 3.4 times more likely to implement indigenous adaptation strategies, possibly because credit access reduces financial constraints and supports the implementation of labour-intensive or resource-demanding indigenous practices. Ogunniyi *et al.* (2023) found that access to credit significantly improved farmers' capacity to adopt both traditional and modern adaptation measures in South-West Nigeria, as it eased liquidity constraints and enabled timely investment in adaptive practices.

5. Conclusion and recommendations

This study examined the factors influencing farmers' use of indigenous and local climate change adaptation strategies in Southern Taraba State, Nigeria. The study concluded that indigenous strategies remain important and widely used among smallholder farmers as affordable and culturally appropriate responses to climate variability. The logistic regression result indicated that age, farming experience, educational level, cooperative membership, access to extension services, access to climate information, perceived effectiveness of indigenous practices, and access to credit significantly influence adoption. This implies that farmers who are more experienced, better informed, socially organised, and financially supported are more likely to rely on indigenous adaptation methods. Based on the finding of the study, the following recommendations were made:

The Government of Taraba State and the Federal Ministry of Agriculture should strengthen and expand agricultural extension services to improve farmers' awareness and effective use of indigenous climate change adaptation strategies.

Government agencies in collaboration with Non-Governmental Organizations (NGOs) should provide farmers with timely and reliable climate information through extension networks, community radio, mobile platforms, and local information centres.

Non-Governmental Organizations (NGOs) and Community-Based Organisations (CBOs) should promote and support farmer cooperative societies to facilitate knowledge sharing, collective learning, and dissemination of indigenous and scientific adaptation practices.

Government, microfinance institutions, and Non-Governmental Organizations (NGOs) should improve farmers' access to affordable credit facilities to reduce financial constraints and enable implementation and scaling of indigenous adaptation strategies.

Government, research institutions, and universities should document, validate, and integrate indigenous knowledge systems into formal agricultural and climate adaptation policies to ensure their preservation and sustainable use.

Compliance with ethical standards

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Disclosure of Conflict of Interest

The author has declared that there is no conflict of interest reported in this study.

References

- [1] Abid, M., Scheffran, J., Schneider, U. A., & Elahi, E. (2020). Farmer perceptions of climate change, observed trends and adaptation of agriculture in Pakistan. *Environmental Management*, 63(1), 110–123. <https://doi.org/10.1007/s00267-018-1113-7>
- [2] Adeagbo, A. O., Ojo, T. O., & Ayanlade, A. (2023). Determinants of farmers' use of indigenous climate change adaptation strategies in Nigeria. *Climate and Development*, 15(4), 312–324. <https://doi.org/10.1080/17565529.2022.2072486>
- [3] Adebo, G. M., & Ajayi, O. C. (2020). Integrating indigenous knowledge into climate change adaptation policy in Africa. *African Journal of Science, Technology, Innovation and Development*, 12(2), 131–140. <https://doi.org/10.1080/20421338.2019.1600457>
- [4] Adebisi, G. L., Ojo, S. O., & Ayanlade, A. (2024). Role of agricultural extension services in enhancing climate change adaptation among smallholder farmers in Nigeria. *Journal of Agricultural Extension*, 28(1), 45–58.
- [5] Adewuyi, S. A., & Bamidele, F. S. (2022). Crop production systems and food security in Taraba State, Nigeria. *Nigerian Journal of Agricultural Economics*, 12(1), 77–89.
- [6] Agboola, O. P., Adeola, R. G., & Oyekale, A. S. (2024). Indigenous knowledge systems and climate change adaptation among crop farmers in Osun State, Nigeria. *Journal of Environmental Management*, 345, 118709. <https://doi.org/10.1016/j.jenvman.2023.118709>
- [7] Ahmed, M. A., Mohammed, S. A., & Umar, A. (2021). Agricultural development and food security in Taraba State, Nigeria. *African Journal of Agricultural Research*, 16(5), 742–750.
- [8] Akinyemi, O., & Ojo, T. O. (2021). Socioeconomic factors influencing climate change adaptation strategies among farmers in Nigeria. *Sustainability*, 13(4), 1987. <https://doi.org/10.3390/su13041987>
- [9] Akudugu, M. A., & Alhassan, A. R. (2022). Education and climate change adaptation among smallholder farmers in West Africa. *Climate and Development*, 14(2), 137–148. <https://doi.org/10.1080/17565529.2021.1889942>
- [10] Ali, A. O., & Egbetokun, A. A. (2022). Access to climate information and adoption of indigenous adaptation practices among smallholder farmers in Northern Nigeria. *Journal of Agricultural Extension*, 26(2), 65–77.
- [11] Aniah, P., Sarpong, G. A., & Gyasi, R. M. (2023). Farmer-based organisations and climate change adaptation in Northern Ghana: The role of social capital in building resilience. *Climate and Development*, 15(2), 186–197.
- [12] Ayanlade, A., Radeny, M., & Morton, J. F. (2023). Climate change adaptation among smallholder farmers in sub-Saharan Africa: The role of indigenous knowledge and socio-economic factors. *Climate Risk Management*, 41, 100551.
- [13] Bamigboye, A. O., Adebayo, O. O., & Adeagbo, A. O. (2025). Indigenous climate adaptation strategies among farming households in Southwestern Nigeria. *Journal of Rural Studies*, 98, 102–113. <https://doi.org/10.1016/j.jrurstud.2024.102113>
- [14] Egeru, A. (2012). Role of indigenous knowledge in climate change adaptation: A case study of pastoral communities in eastern Uganda. *African Journal of Environmental Science and Technology*, 6(4), 173–183.
- [15] Etana, D., Snelder, D. J., Van Wesenbeeck, C. F. A., & Fleskens, L. (2021). Determinants of climate change adaptation decisions among smallholder farmers. *Climate and Development*, 13(6), 508–520. <https://doi.org/10.1080/17565529.2020.1792895>

- [16] Etwire, P. M., Martey, E., Kuwornu, J. K. M., & Owusu, R. K. (2023). *Effect of agricultural extension services on farmers' adoption of climate change adaptation practices in Northern Ghana*. *Climate and Development*, 15(5), 452–463.
- [17] FAO. (2021). *The state of food and agriculture 2021: Making agrifood systems more resilient to shocks and stresses*. Food and Agriculture Organization of the United Nations.
- [18] Gbegbelegbe, S., Serdeczny, O., & Hare, W. (2022). Smallholder agriculture and climate vulnerability in sub-Saharan Africa. *Climatic Change*, 171(3), 28. <https://doi.org/10.1007/s10584-022-03342-9>
- [19] Hassan, A. R., Bello, M., & Umar, B. F. (2022). Effect of cooperative membership on farmers' adoption of climate change adaptation strategies in North-West Nigeria. *Journal of Agricultural Extension*, 26(3), 87–98.
- [20] Idoma, K., Adebayo, A. A., & Tukur, A. L. (2016). Pastoralist coping strategies to climate variability in Northern Nigeria. *Journal of Arid Environments*, 127, 123–131.
- [21] Ifeanyi-Obi, C. C., Ekwueme, C. M., & Adesope, O. M. (2017). Assessment of climate change adaptation strategies among rural farmers in Delta State, Nigeria. *Journal of Agricultural Extension*, 21(1), 68–80.
- [22] Inkani, S., Naidoo, M., & Simatele, D. (2025). Marginalisation of indigenous knowledge systems in climate policy discourse. *Environmental Policy and Governance*, 35(1), 54–67. <https://doi.org/10.1002/eet.2017>
- [23] IPCC. (2021). *Climate change 2021: The physical science basis*. Cambridge University Press. <https://doi.org/10.1017/9781009157896>
- [24] Issahaku, G., & Abdulai, A. (2020). Adoption of climate-smart practices and access to credit in sub-Saharan Africa. *Agricultural Economics*, 51(4), 545–560. <https://doi.org/10.1111/agec.12571>
- [25] Magesa, B. A., Mohan, G., Matsuda, H., Melts, I., Kefi, M., & Fukushi, K. (2023). Understanding the farmers' choices and adoption of adaptation strategies and plans to climate change impact in Africa: A systematic review. *Climate Services*, 30, Article 100362.
- [26] Malabe, I., & Mustapha, S. B. (2025). Indigenous knowledge systems and climate resilience in West Africa. *Sustainability Science*, 20(2), 411–423. <https://doi.org/10.1007/s11625-024-01321-6>
- [27] Mapfumo, P., Mtambanengwe, F., & Chikowo, R. (2016). Building on indigenous knowledge for climate-smart agriculture. *Sustainability*, 8(4), 362. <https://doi.org/10.3390/su8040362>
- [28] Mengistu, N. A. (2024). Farmers' adoption of indigenous knowledge-based off-farm and non-farm livelihoods and its determinants in Takusa Woreda, North-Western Ethiopia. *Cogent Economics & Finance*, 12(1), Article 2364360.
- [29] Munyua, C. N., Mutua, J., & Gathuru, M. (2023). Farmers' perceptions and adoption of indigenous climate adaptation practices in semi-arid Kenya. *Climate and Development*, 15(7), 705–716.
- [30] National Meteorological Agency (NIMET). (2021). *Climate review bulletin for Nigeria*. NIMET.
- [31] Nwankwo, C. A., Okorie, F. C., & Olorunfemi, F. (2020). Indigenous knowledge and climate adaptation in Taraba State. *Journal of Environmental Planning and Management*, 63(9), 1632–1649.
- [32] Nwankwoala, H. O. (2015). Climate change and groundwater resources in Nigeria. *Journal of Geosciences and Geomatics*, 3(1), 1–8.
- [33] Ogunbiyi, S. O., Akinwale, J. A., & Oyekale, A. S. (2021). Climate variability and crop productivity in Nigeria. *International Journal of Climate Change Strategies and Management*, 13(3), 337–352.
- [34] Ogunleye, K. Y., Adepoju, A. A., & Adebayo, O. O. (2023). Financial constraints and climate change adaptation in rural Nigeria. *Journal of Development and Agricultural Economics*, 15(2), 89–101.
- [35] Ogunniyi, A. I., Awotide, B. A., & Aremu, O. (2023). Credit access and adoption of climate change adaptation practices among smallholder farmers in South-West Nigeria. *Journal of Agricultural Extension*, 27(2), 91–103.
- [36] Ojo, T. O., Baiyegunhi, L. J. S., & Salami, A. O. (2021). Adoption of indigenous and modern climate adaptation strategies in Nigeria. *Climate and Development*, 13(7), 621–632.
- [37] Olorunsola, E. O., Ajibefun, I. A., & Oyekale, A. S. (2025). Climate variability and farmers' perceptions in Southwestern Nigeria. *Journal of Climate Change and Agriculture*, 7(1), 15–29.
- [38] Oluwatimilehin, I. O., & Ayanlade, A. (2021). Western bias in climate adaptation research in Africa. *GeoJournal*, 86(6), 2567–2580. <https://doi.org/10.1007/s10708-020-10247-5>

- [39] Oyekale, A. S. (2020). Household size and adoption of climate-smart practices in Nigeria. *Environmental Economics and Policy Studies*, 22(4), 589–605.
- [40] Popoola, O. A., Adepoju, A. A., & Ogunbiyi, S. O. (2020). Indigenous climate adaptation strategies among rural farmers in Nigeria. *Journal of Rural Development*, 39(3), 423–438.
- [41] Serdeczny, O., Adams, S., Baarsch, F., Coumou, D., Robinson, A., Hare, W., Schaeffer, M., Perrette, M., & Reinhardt, J. (2017). Climate change impacts in sub-Saharan Africa. *Regional Environmental Change*, 17(6), 1581–1596. <https://doi.org/10.1007/s10113-017-1169-7>
- [42] Usman, M. B., Ahmed, M. A., & Umar, A. (2023). Livelihood systems and agricultural productivity in Taraba State. *Nigerian Journal of Rural Sociology*, 23(1), 44–58.