

**RELATIONSHIP BETWEEN TRADITIONAL ECOLOGICAL KNOWLEDGE AND
SUSTAINABLE FOREST RESOURCE MANAGEMENT IN RURAL COMMUNITIES OF
BAYELSA STATE, NIGERIA**

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Abstract

This study investigated the relationship between traditional ecological knowledge (TEK) and sustainable forest resource management (SFRM) in rural communities in Bayelsa State, Nigeria. Four objectives, research questions, and hypotheses guided the study. A correlational research design was adopted. The population comprised 58,238 residents across rural communities in the eight Local Government Areas of the state, from which a sample of 400 respondents was selected using a purposive sampling technique. Four communities: Amassoma, Nembe Town, Twon-Brass, and Ogobiri were included in the study. Data were collected using the Traditional Ecological Knowledge and Sustainable Forest Resource Management Questionnaire (TEKSFRMQ), which consisted of two sections: The Traditional Ecological Knowledge Questionnaire (TEQ) and the Sustainable Forest Resource Management Questionnaire (SFRMQ). The instrument was validated and tested for reliability using Cronbach's Alpha, yielding co-efficients of 0.86 for TEQ and 0.82 for SFRMQ. Research questions were answered and hypothesis tested using Pearson's Product-Moment Correlation at the 0.05 level of significance. The findings revealed among others, that the spatial distribution of knowledge has a strong positive and significant relationship with sustainable forest resource management in rural communities. Similarly, land use practices were found to have a strong positive and significant relationship with sustainable forest resource management. The study concluded that traditional Ecological Knowledge plays a significant role in supporting sustainable forest resource management in rural communities. It was recommended that local government authorities should promote and support initiative aimed at documenting and disseminating TEK to enhance its accessibility while agricultural and forestry extension services should facilitate training programmes that integrate indigenous land use practices with modern sustainable techniques.

Keywords: Traditional Ecological Knowledge, Sustainable, Forest Resource, Management, Rural Communities

Introduction

Traditional ecological knowledge is essential for SFRM, especially in rural communities reliant on natural resources for their livelihoods. Bayelsa State in Nigeria's Niger Delta region is known for its vast mangrove forests and riverine environments, which sustain biodiversity and offer vital livelihood opportunities for more than 2 million people, the majority of whom are rural dwellers (National Population Commission, 2023). The state's distinctive ecological characteristics, such as flooding, alluvial soils and vulnerable coastal environments, present challenges in managing forest resources, calling for context-specific approaches built on traditional knowledge and beliefs (World Bank, 2022). TEK refers to localised, accumulated knowledge and practices that result from long histories of interactions between human communities and their environments, and is passed down from generation to generation through cultural learning and transmission (World Bank, 2021). This includes spatial knowledge of the land, sustainable land and forest use, cultural values, and adaptation that inform conservation strategies and practices. From a geographical perspective, TEK

represents the interconnectedness of human-environment interactions influenced by physical, socio-economic, and cultural factors (Udumo et al., 2018). In rural communities of Bayelsa State, key dimensions of TEK such as the spatial distribution of knowledge, land use practices, cultural landscapes and spatial adaptation-play an important role in shaping forest resource management outcomes.

TEK spatial distribution and access are not equal within communities because of gender, age, and social status, and affect forest governance and resource use (Eregha & Alimba, 2020; World Bank, 2022). Indigenous knowledge-based land use practices such as selective harvesting, rotational farming, and sacred grove protection are critical for preserving forest ecosystems while supporting rural livelihoods (Food and Agriculture Organization [FAO], 2022). Indigenous land management practices, including rotational farming, sacred grove conservation, and selective harvesting, play a pivotal role in forest conservation and livelihood sustainability (Aja et al., 2021). Cultural landscapes (traditional practices, taboos, and community forests) act as social-ecological systems that promote sustainable practices through the integration of cultural and ecological processes (United Nations Development Programme [UNDP], 2023).

Moreover, spatial adaptation, or the ability to adapt resource management strategies to environmental and socio-economic shifts (climate change, variability, and socio-economic pressures), is crucial for the resilience of Bayelsa's forest-dependent communities (Sammat et al., 2025). Socio-economic factors, including income, education, access to extension services, and land tenure, greatly affect the effectiveness of sustainable resource management (World Bank, 2022). In Bayelsa, where more than 70% of the population is directly dependent on forest and fishery resources for their livelihood (Nwilo & Badejo, 2021), these interactions are crucial in informing an integrated conservation and development approach.

In this regard, the current study examines the relationships between Traditional Ecological Knowledge and Sustainable Forest Management in rural communities of Bayelsa State, Nigeria, with a focus on spatial distribution of knowledge, land use practices, cultural landscapes, and spatial adaptation.

Statement of the Problem

Traditionally, TEK has informed rural communities of Bayelsa State in forest resource management and conservation through the development of indigenous practices such as selective logging, conservation of sacred forests, and seasonal use of forest resources. But these practices are now threatened by increasing population and agricultural activities, commercialization of forest resources, and deforestation, resulting in environmental degradation. However, external forces and contemporary practices of resource exploitation often impact local practices without offering viable alternatives. Socio-economic factors such as poverty, lack of environmental education, and institutional support further limit rural societies' ability to sustain effective forest management.

In addition, key areas need attention in understanding the role of various aspects of TEK in sustainable forest management. Differences in how knowledge is spatially distributed, land use patterns, and the influence of cultural landscapes on conservation practices are poorly documented. Moreover, little is known about how rural communities adapt spatially to changing environmental conditions like flooding and resource depletion. This knowledge gap constrains context-specific policies that combine indigenous knowledge and modern conservation practices. So, a comprehensive study needs to be undertaken to explore the relationships between these dimensions of TEK and SFRM in rural communities of Bayelsa State.

Aim and Objectives of the Study

This study aimed to investigate TEK and SFRM in rural communities in Bayelsa State. Specifically, the study aims to:

1. assess how the spatial distribution of knowledge relates to SFRM in rural communities.
2. examine how land use practices relate to SFRM in rural communities.
3. determine how the cultural landscape relates to SFRM in rural communities.
4. analyze how spatial adaptation relates to SFRM in rural communities.

Research Question

1. How does the spatial distribution of knowledge relate to SFRM in rural communities?
2. How do land use practices relate to SFRM in rural communities?
3. How does the cultural landscape relate to SFRM in rural communities?
4. How does spatial adaptation relate to SFRM in rural communities?

Hypotheses

H₀₁: Spatial distribution of knowledge does not significantly relate to SFRM in rural communities.

H₀₂: Land use practices do not significantly relate to SFRM in rural communities.

H₀₃: Cultural landscape does not significantly relate to SFRM in rural communities.

H₀₄: Spatial adaptation does not significantly relate to SFRM in rural communities.

Methodology

This study was carried out in Bayelsa State. Bayelsa State, located in Nigeria's Niger Delta region, comprises eight Local Government Areas (LGAs): Brass, Ekeremor, Kolokuma/Opokuma, Nembe, Ogbia, Sagbama, Southern Ijaw, and Yenagoa. The state is predominantly rural, with most LGAs characterized by dispersed settlements and limited urbanization.

The study employed a correlational research design, which was considered appropriate because it allows for the systematic collection and analysis of data to examine the relationships between variables without manipulating them.

The study population consists of 58,238 residents in rural communities across the eight LGAs. The sample size comprised 400 rural dwellers through the Taro Yamane sampling formula. The sample was drawn from four communities selected for their ecological and cultural significance to forest resource management: Amassoma (Ogbia LGA), Nembe Town (Nembe LGA), Twon-Brass (Brass LGA), and Ogobiri (Southern Ijaw LGA).

A purposive sampling technique was adopted to select the four communities: Amassoma, Nembe Town, Twon-Brass, and Ogobiri; due to their ecological relevance, strong dependence on forest resources, and the presence of rich TEK. Within each community, a random sampling technique was employed to select 100 respondents who are knowledgeable about or actively engaged in forest resource management, resulting in a total sample size of 400 participants for the study.

Data for the study were collected using a structured instrument titled the "TEKSFRMQ." The questionnaire consisted of two sections: the TEQ, which included 32 items divided into four subcategories of 8 items each, and the SFRMQ, containing 8 items. Responses were measured on a four-point Likert scale with the options: Strongly Agree (SA = 4), Agree (A = 3), Disagree (D = 2), and Strongly Disagree (SD = 1). A criterion mean of 2.50 was established as the threshold for decision-making.

The two instruments underwent face and content validation by a panel of experts specializing in Environmental Science and Measurement and Evaluation experts to ensure the items were clear, relevant, and adequate for measuring the respective variables. The reliability of each instrument was assessed separately using the Cronbach's Alpha method. TEQ yielded a reliability coefficient of

0.86, while SFRMQ produced a coefficient of 0.82, both indicating high internal consistency and confirming their suitability for the study. Correlation coefficients were interpreted as follows: 0.00-0.19 (very weak), 0.20- 0.39 (weak), 0.40-0.59 (moderate),0.60-0.79(strong),and 0.80-1.00(very strong).

Trained research assistants facilitated data collection by distributing the questionnaires directly to residents within their respective communities. Respondents were provided with assistance as needed to ensure accurate and complete responses. Completed questionnaires were collected immediately to maximize the response rate. Pearson’s Product-Moment Correlation (PPMC) was employed to analyze the data and test the hypotheses at a 0.05 level of significance.

Results

Research Question One: How does the spatial distribution of knowledge relate to SFRM in rural communities?

Hypothesis One: Spatial distribution of knowledge does not significantly relate to SFRM in rural communities.

Table 1: PPMC summary of how the spatial distribution of knowledge relates to SFRM in rural communities

		Correlations	
		Spatial Distribution of Knowledge	SFRM
Spatial Distribution of Knowledge	Pearson Correlation	1	.686**
	Sig. (2-tailed)		.000
	N	400	400
SFRM	Pearson Correlation	.686**	1
	Sig. (2-tailed)	.000	
	N	400	400

** . Correlation is significant at the 0.01 level (2-tailed).

The result in Table 1, revealed a strong positive relationship between spatial distribution of knowledge and sustainable forest resource management ($r = 0.686, p < 0.05$). This result indicates that increased access to ecological knowledge enhances sustainable forest practices. Therefore the null hypothesis was rejected.

Research Question Two: How do land use practices relate to SFRM in rural communities?

Hypothesis Two: Land use practices do not significantly relate to SFRM in rural communities.

Table 2: PPMC summary of how land use practices relate to SFRM in rural communities

		Correlations	
		Land Use Practices	SFRM
Land Use Practices	Pearson Correlation	1	.789**
	Sig. (2-tailed)		.000
	N	400	400
SFRM	Pearson Correlation	.789**	1
	Sig. (2-tailed)	.000	
	N	400	400

** . Correlation is significant at the 0.01 level (2-tailed).

The result in Table 2 revealed a strong positive relationship between land use practices and sustainable forest resource management ($r = 0.789, p > 0.05$). This indicates that increase in land use practices enhances sustainable forest practices. Therefore the null hypothesis was rejected.

Research Question Three: How does the cultural landscape relate to SFRM in rural communities?

Hypothesis Three: Cultural landscape does not significantly relate to SFRM in rural communities.

Table 3: PPMC summary of how the cultural landscape relates to SFRM in rural communities

		Cultural Landscape	SFRM
Cultural Landscape	Pearson Correlation	1	.710**
	Sig. (2-tailed)		.000
	N	400	400
SFRM	Pearson Correlation	.710**	1
	Sig. (2-tailed)	.000	
	N	400	400

** . Correlation is significant at the 0.01 level (2-tailed).

The result in Table 3 revealed a strong positive relationship between cultural landscape and sustainable forest resource management ($r = 0.710, r < 0.05$). This indicates that increased access to cultural landscape enhances sustainable forest practices. Therefore, the null hypothesis was rejected.

Research Question Four: How does spatial adaptation relate to SFRM in rural communities?

Hypothesis Four: Spatial adaptation does not significantly relate to SFRM in rural communities.

Table 4: PPMC summary of how spatial adaptation relate to SFRM in rural communities

		Spatial Adaptation	SFRM
Spatial Adaption	Pearson Correlation	1	.839**
	Sig. (2-tailed)		.000
	N	400	400
SFRM	Pearson Correlation	.839**	1
	Sig. (2-tailed)	.000	

N	400	400
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** . Correlation is significant at the 0.01 level (2-tailed).

The result in Table 4 revealed a strong positive relationship between spatial adaptation and sustainable forest resource management. ($r = 0.839$, $p < 0.05$). This indicates that increased access to spatial adaptation enhances sustainable forest practices. Therefore the null hypothesis was rejected.

Discussion of Findings

The findings of this study reveal that the spatial distribution of Traditional Ecological Knowledge (TEK) has a strong positive and significant relationship with Sustainable Forest Resource Management (SFRM) in rural communities of Bayelsa State. This suggests that access to and sharing of ecological knowledge across different segments of the community enhance the effectiveness of forest management practices. In contexts where knowledge is widely distributed rather than concentrated among specific groups, communities are better positioned to adopt sustainable practices collectively. This finding aligns with Rafiu et al. (2026), who showed that indigenous food plants and associated knowledge greatly contribute to rural livelihoods in Nigerian states. Likewise, Usman et al. (2023) revealed the importance of traditional knowledge in biodiversity conservation in communities around forest reserves, stressing the need for knowledge exchange across generations.

The study further established that land use practices have a strong positive and significant with SFRM. This indicates that indigenous land management strategies-such as selective harvesting, rotational farming and conservation of sacred groves-play a crucial role in maintaining ecological balance while supporting rural livelihoods. The result underscores the relevance of locally adapted practices, which are often more sustainable than externally imposed systems because they are developed through long term interaction with the environment. This aligns with Kana et al. (2025), who revealed that local knowledge systems support effective water and land management in rural communities of Nigeria. Similarly, Sraku-Lartey (2014) found that indigenous land use and soil fertility practices are fundamental in sustainable forest management in Ghana, and that such traditional practices are common practice.

In addition, the findings show that cultural landscape has a strong positive and significant relationship with SFRM. This implies that cultural beliefs, traditional norms, and community-based conservation practices contribute meaningfully to sustainable forest management. Cultural elements such as taboos, sacred sites, and community regulations function as informal governance systems that regulate resource use and prevent overexploitation. This is in line with Kana et al. (2025), who highlighted the role of indigenous knowledge in resource management regardless of educational level. Sraku-Lartey (2014) also observed that cultural practices based on indigenous knowledge promote sustainable forest conservation.

Furthermore, the study found that spatial adaptation exhibits a very strong positive and significant relationship with SFRM. This suggests that the ability of rural communities to adjust their resource use practices in response to environmental and socio-economic changes-such as flooding, climate variability, and resource scarcity- is a critical determinant of sustainability. Communities that demonstrate adaptive capacity are more resilient and better able to sustain forest resources overtime. Kana et al. (2025) pointed out that socio-economic variables like education, credit, farm size, and extension services are important factors in adopting sustainable conservation practices. Agadaga et al. (2024) also explained the constraints, such as cost of operations, availability of labour, and capital that affect the adoption of farmland management practices, clearly confirming that socio-economic factors play a significant role in the use of indigenous practices.

Conclusion

This study demonstrated that key dimensions of Traditional Ecological Knowledge-spatial distribution, land use practices, cultural landscapes and spatial adaptation- are positively and significantly related to sustainable forest resource management in rural communities of Bayelsa State. These findings highlight the importance of integrating indigenous knowledge systems into formal environmental management frameworks to enhance sustainability and resilience in forest-dependent communities.

Recommendations

1. Local government authorities should promote initiatives that document and disseminate Traditional Ecological knowledge to improve accessibility and intergenerational transfer.
2. Agricultural and forestry extension services should integrate indigenous practices with modern sustainable techniques through targeted training programmes.
3. Community leaders should support the preservation of cultural landscapes and traditional conservation practices.
4. Development agencies should implement socio-economic support programmes to address constraints such as limited access to credit and labour.

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