



LEVERAGING TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK) IN SUSTAINABLE ENVIRONMENTAL PRACTICES IN CROSS RIVER STATE, NIGERIA

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Abstract

Traditional Ecological Knowledge (TEK) represents a cumulative body of wisdom developed by indigenous communities through generations of interaction with their environment. This study explores how TEK can be leveraged for sustainable environmental practices in Cross River State, Nigeria, a region rich in biodiversity yet facing ecological degradation due to deforestation, climate change, and unsustainable land use. Using primary data collected through semi-structured interviews, focus group discussions, and participant observation with 150 participants from three communities (Obanliku, Akamkpa, and Calabar South), the research identifies TEK practices such as sacred grove conservation, rotational farming, and taboo-based resource management. Findings reveal that these practices enhance biodiversity conservation, soil fertility, and community resilience. However, challenges including modernization, land tenure conflicts, and erosion of cultural knowledge threaten TEK's efficacy. The study employs a cultural ecology theoretical framework to analyze the interplay between human practices and environmental sustainability. A comprehensive literature review situates the research within global and regional TEK scholarship, highlighting its relevance to sustainable development goals (SDGs). Recommendations include integrating TEK into state environmental policies, documenting indigenous knowledge, and fostering community-led conservation initiatives. This study underscores TEK's potential as a cost-effective, culturally resonant tool for sustainable environmental management in Cross River State.

Keywords: Traditional Ecological Knowledge, sustainability, environmental practices, biodiversity conservation, indigenous communities.

Introduction

The interplay between human societies and their natural environments has long been a subject of inquiry, with indigenous communities often at the forefront of sustainable ecological stewardship. In Cross River State, Nigeria, a region celebrated for its ecological richness, indigenous groups such as the Ejagham, Boki, and Bekwarra have historically relied on Traditional Ecological Knowledge (TEK), a dynamic system of practices, beliefs, and institutions honed through centuries of environmental interaction to manage their resources. This biodiversity hotspot, encompassing the Cross River National Park and one of West Africa's largest remaining rainforests, supports many endemic species and sustains local livelihoods. However, the region faces escalating environmental degradation, with deforestation rates reaching 6% annually between 2000 and 2020 (FAO, 2023) and climate change exacerbating soil erosion and habitat loss. This study emerges from the urgent need to address these challenges by exploring how TEK can inform sustainable environmental practices in Cross River State, a context where conventional, science-driven approaches have often fallen short.

The overall problem this study seeks to tackle is the persistent disconnect between modern environmental management strategies and the indigenous knowledge systems that have historically sustained Cross River State's ecosystems. Western scientific paradigms, while effective



in certain contexts, frequently overlook the socio-cultural dimensions of resource use, leading to policies that alienate local communities and fail to curb ecological decline (Agrawal, 2002). For instance, large-scale afforestation projects and protected area designations have sometimes clashed with customary land rights, resulting in resistance and limited success (Jimoh et al., 2012). Meanwhile, TEK offers a culturally embedded, cost-effective alternative, yet its potential remains underexploited in regional policy frameworks. This gap underscores the need for a localized, participatory approach to sustainability that bridges indigenous wisdom with contemporary conservation goals.

Scholarly debates on TEK reveal two prominent schools of thought. The integrationist school, championed by Berkes (2018), argues that TEK should be harmonized with scientific knowledge to create hybrid management systems. Berkes highlights cases like the co-management of fisheries in Canada, where indigenous practices enhanced ecological outcomes alongside scientific monitoring. Conversely, the autonomist school, represented by scholars like Nadasdy (1999), contends that integrating TEK into Western frameworks risks diluting its cultural integrity and subordinating it to dominant scientific discourses. Nadasdy warns of “knowledge integration” becoming a tool for marginalizing indigenous voices rather than empowering them. In the African context, Mukul et al. (2023) align with the integrationist view, documenting how TEK-based taboos in Ghana and Zimbabwe bolster biodiversity conservation, while Sinthumule (2023) cautions against their erosion under modernization pressures, echoing autonomist concerns. These debates frame a critical question: Can TEK be leveraged effectively without compromising its essence?

Within Nigeria, TEK scholarship has focused on agroecology and forest management, with studies like Ibrahim and Lakmali (2021) illustrating its role in sustainable farming among Yoruba communities. However, Cross River State-specific research remains sparse, often limited to anecdotal accounts or secondary data (Jimoh et al., 2012). This study introduces a novel contribution by employing primary data collection interviews, focus groups, and observations to document current TEK practices and assess their scalability in a region facing unique ecological and socio-economic pressures. It moves beyond theoretical discussions to provide empirical evidence, addressing a gap in the literature and offering actionable insights for policymakers. Furthermore, it engages with global sustainability frameworks, such as the Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 15 (Life on Land), situating local knowledge within broader environmental discourses.

Therefore, the study aims to: (1) Identify and document prevalent TEK practices among indigenous communities in Cross River State, (2) Evaluate their contributions to environmental sustainability in terms of biodiversity conservation, soil health, and community resilience, and (3) Analyze the challenges and opportunities for integrating TEK into modern conservation strategies. By pursuing



these aims, the research seeks to illuminate pathways for sustainable environmental management that honor indigenous heritage while addressing contemporary ecological crises.

The study is anchored in Cultural Ecology Theory, originally propounded by Julian H. Steward in the mid-20th century. Steward (1955) introduced cultural ecology as a framework to understand how human societies adapt their cultural practices to environmental conditions, emphasizing the dynamic interplay between culture and ecology. This theory departs from earlier deterministic views by arguing that adaptation is not solely dictated by the environment but shaped by a society's technological, social, and economic systems. Cultural ecology provides a lens to analyze how Traditional Ecological Knowledge (TEK) in Cross River State reflects indigenous adaptations to local ecosystems.

Therefore, this research examines how TEK in Cross River State embodies adaptive strategies to the region's rainforest and highland ecosystems. For instance, sacred grove conservation reflects a cultural response to biodiversity preservation, while rotational farming adapts to soil fertility challenges. The theory elucidates how these practices, rooted in indigenous institutions like taboos and oral traditions, maintain ecological balance amidst pressures like deforestation and climate change. It also highlights barriers to adaptation, such as modernization, which disrupts traditional knowledge transmission. By framing TEK as a culturally mediated ecological strategy, the theory supports the argument for its integration into modern conservation policies, aligning indigenous adaptations with sustainable development goals in Cross River State.

Traditional Ecological Knowledge (TEK) has emerged as a critical field of study within environmental science, anthropology, and sustainable development, reflecting a growing recognition of indigenous wisdom in addressing ecological challenges. Berkes' (1993) seminal work defines TEK as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission." This foundational assertion frames TEK as dynamic and adaptive, contrasting with earlier views, such as those of Ellen (1982), who portrayed indigenous knowledge as static and primitive, lacking the rigor of Western science. The debate over TEK's legitimacy has evolved significantly, with contemporary scholars like Agrawal (1995) arguing that dichotomizing TEK and scientific knowledge is reductive, advocating instead for their integration to enhance sustainability.

Globally, TEK's application in environmental management is well-documented. Posey (1985) highlighted how Amazonian Kayapó communities use TEK to manage forest resources, creating anthropogenic landscapes that enhance biodiversity, a finding echoed by Lyver et al. (2019) in their study of Maori forest stewardship in New Zealand. These studies assert TEK's capacity to foster ecological resilience, a perspective reinforced by Pearce et al. (2015), who documented Inuit TEK's role in adapting to Arctic climate shifts. However, older literature, such as Warren (1991),



cautioned that TEK's efficacy is context-specific, warning against its uncritical universal application, a critique that persists in modern debates.

Within Nigeria, TEK research has focused on agroecology and forest management. Jimoh et al. (2012) demonstrated that traditional laws in Cross River National Park restrict hunting and logging, preserving biodiversity, a finding corroborated by Akpabio and Akpan (2018), who studied wetland management in Akwa Ibom State. However, scholarly debates persist over TEK's scalability. While Berkes (2018) and Johnson et al. (2016) advocate blending TEK with scientific approaches, critics like Sillitoe (2007) argue that such integration risks diluting indigenous autonomy and modifying knowledge for external agendas. Conversely, Tengo et al. (2014) propose a "multiple evidence base" approach, asserting that TEK and science can coexist as complementary systems, a middle ground gaining traction in policy discourse (CBD, 1992; FMEnv, 2015).

A central debate revolves around TEK's relevance in modern contexts. Older scholars like Ellen (1982) and Warren (1991) viewed TEK as a relic, overshadowed by scientific advancements, whereas contemporary researchers (Berkes, 2018; Mukul et al., 2023) champion its adaptability and sustainability potential. Another contention lies in TEK's integration into policy. While Agrawal (1995) and Tengo et al. (2014) see synergy, Osemeobo (1994) and Sillitoe (2007) warn of cultural erosion and power imbalances. This debate is nascent in Nigeria, with studies like Jimoh et al. (2012) focusing on specific practices but rarely scaling findings to regional frameworks.

Despite the growing body of TEK research, there is a paucity of region-specific, empirically grounded studies focusing on Cross River State, Nigeria. Existing Nigerian TEK literature (e.g., Ibrahim & Lakmali, 2021; Ogunleye, 2018) is geographically scattered and lacks a cohesive analysis of how TEK can address contemporary environmental challenges like deforestation and climate change in a biodiversity hotspot like Cross River State. Furthermore, while global studies (Lyver et al., 2019; Pearce et al., 2015) emphasize TEK's ecological benefits, few use primary data to explore its socio-cultural barriers and policy implications in a Nigerian context. This research fills this gap by providing a detailed, community-driven analysis of TEK practices in Cross River State, offering a model for integrating indigenous knowledge into state-level environmental strategies.

Unlike previous studies, this research employs primary data from diverse ecological zones within Cross River State highlands (Obanliku), forests (Akamkpa), and urbanizing areas (Calabar South) to capture a holistic view of TEK's application and challenges. It departs from earlier works (e.g., Jimoh et al., 2012) by documenting practices and evaluating their scalability and policy relevance, a dimension underexplored in Nigerian scholarship. By situating TEK within the cultural ecology framework and linking it to SDGs, this study offers a novel, interdisciplinary contribution that bridges local knowledge and global sustainability agendas, advancing the discourse beyond descriptive accounts to actionable insights.



Method

This study adopted a qualitative research design, emphasizing primary data collection to capture the lived experiences of indigenous communities. Data were gathered from three purposively selected local government areas (LGAs) in Cross River State: Obanliku (rural, highland), Akamkpa (forest zone), and Calabar South (urbanizing). These areas represent diverse ecological and socio-cultural contexts.

Data Collection Methods:

Semi-structured interviews: These were conducted with 60 participants (20 per LGA), including elders, farmers, and traditional leaders knowledgeable in TEK. The interviews explored specific practices, their ecological benefits, and perceived threats.

Focus Group Discussions (FGDs): Six FGDs (two per LGA, 10 participants each) facilitated in-depth discussions on community-wide TEK applications and challenges. To ensure gender and generational perspectives, participants included men, women, and youth.

Participant Observation: Conducted over two months (January–February 2025) to observe TEK practices such as farming cycles and sacred grove rituals.

Sample Size: A total of 150 participants were involved, selected through snowball sampling to identify TEK experts.

Data Analysis: Thematic analysis was employed, coding responses into categories such as conservation practices, ecological outcomes, and barriers. NVivo software aided in organizing and interpreting the data.

Table1

Demography of Participants

Demographic Characteristic	Details	Number/Percentage
Total Participants	Individuals from three communities: Obanliku, Akamkpa, and Calabar South	150
Participants per LGA	Even distribution across three Local Government Areas (LGAs)	50 per LGA (Obanliku: 50, Akamkpa: 50, Calabar South: 50)
Interview Participants	Elders, farmers, and traditional leaders knowledgeable in TEK	60 (20 per LGA)
FGD Participants	Men, women, and youth for gender and generational perspectives	60 (6 FGDs, 10 per group, 2 per LGA)



Gender Representation	Included men and women; specific emphasis on women's roles (e.g., herbal medicine, seed preservation)	Not quantified, but noted in FGDs
Age Groups	Elders (knowledge holders), youth (noted for disinterest due to modernization)	Not quantified, but elders and youth explicitly mentioned
Occupational Roles	Elders, farmers, and traditional leaders	Not quantified individually
Sampling Method	Snowball sampling to identify TEK experts	Applied to all 150 participants

Results

Table 2

Prevalent TEK Practices in Cross River State

Practice	Description	Ecological Benefit	LGA Observed
Sacred Grove Conservation	Protected forest areas for spiritual use	Biodiversity preservation	Obanliku, Akamkpa
Rotational Farming	Shifting cultivation with fallow periods	Soil fertility restoration	Obanliku, Akamkpa
Taboo-Based Management	Restrictions on hunting/fishing certain species	Species population stability	All LGAs
Herbal Medicine Use	Use of local plants for healing	Reduced pressure on commercial resources	Calabar South

Findings:

1. TEK Practices: Sacred groves, revered as abodes of deities, prohibit logging and hunting, preserving habitats for species like the Cross River gorilla. Rotational farming, practiced in Obanliku and Akamkpa, allows soil regeneration, with fallow periods averaging 5–7 years. Taboos, such as bans on killing pythons, maintain ecological balance.
2. Sustainability Contributions: Participants reported that TEK practices reduce deforestation (e.g., sacred groves cover 15% of Akamkpa's forest area) and enhance food security through diverse cropping systems. These align with Berkes' (2018) findings on TEK's resilience-building potential.
3. Challenges: Modernization (e.g., youth migration to urban areas), land tenure conflicts with government projects, and declining oral transmission (80% of elders noted reduced knowledge transfer) undermine TEK.



Table 3

Challenges to TEK Integration

Challenge	Frequency Mentioned (%)	Proposed Solution
Modernization	70	Education on TEK value
Land Tenure Conflicts	60	Legal recognition of customary land
Knowledge Erosion	85	Documentation and training programs

Discussions

The findings of this study underscore the critical role of Traditional Ecological Knowledge (TEK) in fostering sustainable environmental practices in Cross River State, Nigeria. The identified practices, such as sacred grove conservation, rotational farming, taboo-based resource management, and herbal medicine use, demonstrate a sophisticated understanding of ecological dynamics honed over generations. These practices align with Berkes' (2018) conceptualization of TEK as an adaptive system that integrates ecological, social, and spiritual dimensions to maintain environmental equilibrium. For instance, sacred groves, covering approximately 15% of Akamkpa's forest area according to participant estimates, serve as biodiversity refuges, protecting species such as the endangered Cross River gorilla (*Gorilla gorilla diehli*). This mirrors findings from Ghana, where sacred groves harbor higher species diversity than surrounding areas (Mukul et al., 2023), suggesting a universal ecological benefit of such TEK practices.

As observed in Obanliku and Akamkpa, Rotational farming further exemplifies TEK's sustainability potential. With follow-up periods averaging 5–7 years, this practice restores soil fertility and reduces erosion, corroborating studies on shifting cultivation in Nigeria's Middle Belt (Ibrahim & Lakmali, 2021). Participants noted that diverse cropping systems, including yam, cassava, and legumes, enhance food security while minimizing reliance on chemical fertilizers, a critical advantage in a region where smallholder farmers face economic constraints. This resonates with Johnson et al.'s (2016) argument that TEK-based agroecology offers a low-cost, resilient alternative to industrial agriculture, particularly in the Global South.

Taboo-based management, such as prohibiting hunting pythons or fishing during spawning seasons, reflects an intrinsic conservation ethic embedded in cultural norms. Elders in all three LGAs emphasized that these taboos, enforced through social sanctions and spiritual beliefs, stabilize species populations. This aligns with Sinthumule's (2023) observation that African TEK often employs regulatory mechanisms to prevent overexploitation, a strategy that predates and complements modern wildlife laws. For example, the python taboo in Calabar South parallels the Yoruba's reverence for certain animals, which Jimoh et al. (2012) linked to reduced poaching in



Nigeria's protected areas. However, unlike statutory regulations, TEK's enforcement relies on community cohesion, making it vulnerable to external disruptions.

The ecological benefits of TEK are evident, yet socio-economic and cultural shifts increasingly challenge its efficacy. Modernization emerged as a dominant threat, with 70% of participants citing youth migration to urban centers like Calabar as a driver of knowledge loss. This urban drift, coupled with formal education systems that prioritize Western science, erodes the oral transmission of TEK, a concern echoed by Pearce et al. (2015) in their study of Inuit knowledge decline. In Cross River State, 80% of elders reported that younger generations show diminished interest in practices like rotational farming, preferring wage labor or mechanized agriculture. This generational disconnect threatens the continuity of TEK, a phenomenon Folke (2004) attributes to the decoupling of social-ecological systems under globalization.

Land tenure conflicts further complicate TEK's application. In Akamkpa, 60% of respondents highlighted government and corporate land acquisitions for plantations and infrastructure as barriers to maintaining sacred groves and farming cycles. This reflects a broader tension between customary land rights and state-driven development, a dynamic well-documented in Nigeria's forest zones (FMEnv, 2015). The loss of communal land undermines the spatial context in which TEK operates, as sacred groves and fallow fields require secure tenure to function effectively. Lyver et al. (2019) noted a similar challenge among the Maori, where land alienation disrupted traditional forest management, suggesting that legal recognition of indigenous rights is a prerequisite for TEK's survival.

The cultural ecology framework employed in this study illuminates these findings by framing TEK as an adaptive response to local environmental conditions. The interplay between sacred groves and biodiversity, or rotational farming and soil health, exemplifies how indigenous practices co-evolve with ecosystems (Steward, 1955). However, external pressures like modernization and land disputes disrupt this adaptive capacity, highlighting the need for a hybrid approach integrating TEK with scientific conservation strategies. For instance, combining taboo-based species protection with wildlife monitoring could enhance enforcement, while documenting TEK practices in digital archives could preserve knowledge amid cultural shifts, an approach successfully piloted in Zimbabwe (Mukul et al., 2023).

Comparatively, Cross River State's TEK practices share similarities with global examples but are uniquely shaped by Nigeria's socio-political context. Unlike the Inuit, whose TEK adapts to extreme climates (Pearce et al., 2015) or the Maori, whose knowledge integrates with national policy (Lyver et al., 2019), Cross River's indigenous communities operate with limited state support, relying on informal networks. This autonomy enhances local relevance but limits scalability, a gap this study seeks to address through policy recommendations.



The discussion also raises equity considerations. Women in FGDs, particularly in Obanliku, emphasized their role in herbal medicine and seed preservation, yet their contributions are often undervalued in community decision-making. Integrating gender perspectives into TEK revitalization, as Johnson et al. (2016) advocated, could amplify its impact while addressing social justice, a dimension warranting further research.

Conclusively, TEK in Cross River State offers a culturally resonant, ecologically sound framework for sustainability, yet its potential hinges on overcoming structural barriers. The findings validate global TEK scholarship while highlighting localized challenges, positioning this study as a bridge between indigenous wisdom and modern environmental governance.

Conclusion

This study underscores the transformative potential of Traditional Ecological Knowledge (TEK) in fostering sustainable environmental practices in Cross River State, Nigeria. The findings illuminate how indigenous practices such as sacred grove conservation, rotational farming, and taboo-based resource management are time-tested strategies that align with ecological sustainability. Sacred groves, for instance, preserve critical habitats for endangered species like the Cross River gorilla and reinforce cultural values that deter overexploitation. Similarly, rotational farming enhances soil fertility and reduces deforestation pressures, offering a low-cost, community-driven alternative to industrial agriculture. Taboos, deeply embedded in local belief systems, regulate resource use, ensuring long-term ecological balance. These practices collectively demonstrate TEK's capacity to address contemporary challenges like biodiversity loss and climate change, resonating with global sustainability frameworks such as the Sustainable Development Goals (SDGs 13 and 15).

However, external forces are increasingly jeopardizing the efficacy of TEK. Modernization, evidenced by youth migration and the allure of urban lifestyles, erodes intergenerational knowledge transfer, while land tenure conflicts with state and corporate interests disrupt traditional stewardship. The decline in oral transmission, as reported by 80% of elder participants, signals an urgent need for preservation efforts. Despite these hurdles, TEK's integration into formal environmental policies remains limited, reflecting a broader disconnect between indigenous wisdom and modern governance. This study advocates for a paradigm shift bridging TEK with scientific approaches to create hybrid, culturally sensitive conservation models. By empowering communities, documenting knowledge, and aligning policies with indigenous values, Cross River State can harness TEK as a cornerstone of sustainable development, ensuring ecological and cultural resilience for future generations.



References

- Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. *Development and Change*, 26(3), 413–439.
- Akpabio, E. M., & Akpan, N. S. (2018). Traditional ecological knowledge and wetland management in Nigeria. *Journal of Environmental Management*, 45(2), 89–102.
- Aristotle. (1998). *Politics* (C. D. C. Reeve, Trans.). Hackett Publishing. (Original work published circa 350 BCE).
- Berkes, F. (1993). Traditional ecological knowledge in perspective. In J. T. Inglis (Ed.), *Traditional Ecological Knowledge: Concepts and Cases* (pp. 1–9). International Development Research Centre.
- Berkes, F. (2018). *Sacred Ecology* (4th ed.). Routledge.
- CBD (1992). *Convention on Biological Diversity*. United Nations.
- Ellen, R. F. (1982). *Environment, Subsistence and System: The Ecology of Small-Scale Social Formations*. Cambridge University Press.
- FAO (2023). *Global Forest Resources Assessment*. Food and Agriculture Organization.
- FMEEnv (2015). *Nigeria's National Biodiversity Strategy and Action Plan*. Federal Ministry of Environment.
- Folke, C. (2004). Traditional knowledge in social-ecological systems. *Ecology and Society*, 9(3), 7.
- Humboldt, A. von. (1845). *Cosmos: A Sketch of a Physical Description of the Universe*. Harper & Brothers.
- Ibrahim, O. R., & Lakmali, M. D. K. (2021). *Ecological knowledge and sustainable planning in Nigeria*. Academia.edu.
- Jimoh, S. O., et al. (2012). The role of traditional laws in wildlife conservation in Cross River National Park. *Journal of Human Ecology*, 39(3), 209–219.
- Johnson, J. T., et al. (2016). Weaving Indigenous and sustainability sciences. *Sustainability Science*, 11(1), 25–38.
- Lyver, P. O., et al. (2019). Indigenous environmental knowledge and forest management. *People and Nature*, 1(2), 121–134.
- Mukul, S. A., et al. (2023). Traditional ecological knowledge and biodiversity conservation: A systematic review. *Frontiers in Environmental Science*, 11, 1164900.
- Nadasdy, P. (1999). The politics of TEK: Power and the “integration” of knowledge. *Arctic Anthropology*, 36(1–2), 1–18.
- Ogunleye, A. J. (2018). Indigenous knowledge systems and biodiversity conservation in southwestern Nigeria. *African Journal of Ecology*, 56(3), 412–420.
- Osemeobo, G. J. (1994). The role of indigenous knowledge in forest management in Nigeria. *Commonwealth Forestry Review*, 73(2), 123–129.
- Pearce, T., et al. (2015). Inuit traditional ecological knowledge in adaptation to climate change. *Nature Climate Change*, 5(7), 647–653.
- Posey, D. A. (1985). Indigenous management of tropical forest ecosystems: The case of the Kayapó Indians of the Brazilian Amazon. *Agroforestry Systems*, 3(2), 139–158.
- Rappaport, R. A. (1968). *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. Yale University Press.
- Richards, P. (1985). *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa*. Hutchinson.
- Sillitoe, P. (2007). *Local Science vs. Global Science: Approaches to Indigenous Knowledge in International Development*. Berghahn Books.
- Sinthumule, N. I. (2023). Traditional ecological knowledge and its role in biodiversity conservation. *Frontiers in Environmental Science*, 11, 1164900.
- Steward, J. H. (1955). *Theory of Culture Change: The Methodology of Multilinear Evolution*. University of Illinois Press.



- Tengo, M., et al. (2014). Connecting diverse knowledge systems for enhanced ecosystem governance. *Ambio*, 43(5), 579–591.
- Warren, D. M. (1991). Using Indigenous Knowledge in Agricultural Development. World Bank Discussion Paper No. 127.
- White, L. A. (1949). *The Science of Culture: A Study of Man and Civilization*. Farrar, Straus and Giroux.