

Agricultural Co-operative Societies' Utilization of Indigenous Knowledge and Climate Change Mitigation in Nigeria

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Abstract

To improve climate change mitigation and environmental sustainability in Nigeria, agricultural co-operative societies should make effective use of indigenous agricultural and environmental conservation practices. However, indigenous knowledge and the institutional role of agricultural co-operative societies continue to be insufficiently integrated and efforts to mitigate climate change still heavily rely on contemporary technologies. The study therefore examined how using indigenous agricultural practices by co-operative societies affects climate change mitigation, as well as how using indigenous environmental conservation practices by agricultural co-operative societies affects climate change mitigation. Descriptive survey research design was adopted for the study, with 384 farmers from the three agricultural zones of Enugu State sampled through multistage sampling. Data were collected using a well-structured and validated questionnaire with a reliability coefficient of 0.83 obtained through Cronbach's Alpha. SPSS 28 was used to descriptively analyze data in means based on a 4-point scale. Results showed that the utilization of indigenous agricultural practices ($\bar{x}$ =2.792) and utilization of indigenous environmental conservation practices ($\bar{x}$ =2.783) by agricultural co-operative societies significantly affect climate change mitigation in Nigeria. Through programs for training indigenous knowledge, the government should support agricultural co-operatives and increase community involvement in climate mitigation initiatives. Through ongoing member education and co-operative environmental initiatives across the country, agricultural co-operative societies should institutionalize indigenous conservation practices. By illustrating how agricultural co-operative societies institutionalize indigenous agricultural and environmental conservation practices as complementary mechanisms for bolstering climate change mitigation in Nigeria, the study closed the empirical gap.

Keywords: Traditional Ecological Knowledge, Environmental Sustainability, Community-Based Natural Resource Management, Climate Resilience, Sustainable Agricultural Practices

INTRODUCTION

In the twenty-first century, climate change has become one of the most important environmental and developmental issues facing the world community. In both developed and developing nations, rising global temperatures, unpredictable rainfall patterns, frequent flooding, protracted droughts, biodiversity loss and falling agricultural productivity continue to pose threats to sustainable development, food security and socioeconomic stability. In Sub-Saharan Africa, where livelihoods primarily depend on climate-sensitive industries like agriculture, forestry and fisheries, the negative effects of climate change are especially severe (Leal Filho *et al.*, 2025). Nigeria remains one of the African nations suffering from the increasing effects of climate variability, as shown by the country's frequent flooding in the south, the country's increasing desertification in the north, rising coastal erosion, decreasing soil fertility and erratic weather patterns that threaten rural livelihoods and agricultural output. Concerns about food insecurity, environmental deterioration, and falling economic productivity have grown as a result of these environmental issues, making locally adaptable and sustainable methods of mitigating climate change necessary (Anukwonke & Okonkwo, 2025).

Even though scientific and technological advancements like carbon sequestration, renewable energy, climate-smart agriculture and early warning systems have continued to dominate strategies for mitigating climate change, more focus is now being placed on indigenous knowledge as a supplementary strategy for dealing with environmental issues. Indigenous knowledge is made up of the experiences, beliefs, values and customs that local communities have accumulated over many generations of constant interaction with their natural surroundings. Such information demonstrates a thorough comprehension of regional ecosystems and offers workable solutions for environmental management that are frequently affordable, socially acceptable and environmentally sustainable (Akinsemolu *et al.*, 2025). Indigenous knowledge continues to have an impact on farming practices, the management of natural resources and environmental preservation in many Nigerian communities, making it a crucial part of community-based efforts to mitigate climate change.

However, institutional mechanisms that are able to preserve, promote and distribute indigenous knowledge among community members are crucial to its efficacy in addressing environmental challenges. In this sense, co-operative societies have become more significant grassroots institutions that support community mobilization, knowledge exchange, collective action and sustainable rural development (International Co-operative Alliance [ICA], 2024). In addition to their customary economic roles of lending money, selling agricultural products and enhancing the well-being of their members, co-operative societies also act as venues for the dissemination of indigenous knowledge, the encouragement of ecologically conscious behavior and the bolstering of community involvement in the management of natural resources. Co-operative societies offer chances for incorporating indigenous knowledge into local responses to climate change because of their democratic structure, group decision-making procedures and vast rural networks. Therefore, enhancing the use of indigenous knowledge through co-operative societies presents a significant opportunity to improve Nigeria's efforts to mitigate climate change (Food and Agricultural Organization [FAO], 2023).

Historically, indigenous communities relied extensively on traditional knowledge systems to regulate their interactions with the environment long before the emergence of formal scientific approaches. Local communities developed effective methods of conserving forests, protecting water resources, maintaining

soil fertility and predicting seasonal climatic variations through continuous observation and practical experience accumulated over many generations. However, colonial administration and subsequent modernization policies gradually displaced many indigenous environmental management systems by emphasizing Western scientific approaches while giving limited recognition to traditional ecological knowledge (Olaopa, 2025). More recently, increasing environmental challenges have renewed scholarly and policy interest in integrating indigenous knowledge with contemporary environmental management strategies because many indigenous practices have demonstrated significant capacity to enhance ecosystem resilience and promote sustainable environmental governance (Kosoe *et al.* 2025). The strategic significance of community-based organizations, especially co-operative societies, in conserving and advancing indigenous environmental knowledge is further highlighted by this new acknowledgment.

Indigenous agricultural practices are locally created farming techniques that have developed over generations of practical experience and adaptation to particular ecological conditions (Akinsemolu *et al.*, 2025). Crop rotation, mixed cropping, agroforestry, organic manure application, traditional irrigation methods, indigenous seed preservation and seasonal planting based on indigenous weather forecasting systems are some of these practices. These methods decrease reliance on artificial agricultural inputs, increase soil fertility, preserve biodiversity and strengthen ecosystem resilience. Co-operative societies actively support these traditional farming methods in many Nigerian rural communities through farmers' organizations, training courses, demonstration farms, and group extension initiatives. By facilitating the exchange of local agricultural knowledge among members, agricultural co-operative societies contribute to sustainable agricultural production while simultaneously reducing greenhouse gas emissions, limiting land degradation and enhancing the adaptive capacity of farming households (Ekeogu *et al.* (2025). As a result, using native farming methods through co-operative societies has emerged as a crucial strategy for reducing climate change and promoting sustainable agricultural growth (Inkani *et al.* 2025).

indigenous environmental conservation practices refer to customs, cultural beliefs and community-based resource management systems often implemented by farmers in order to maintain ecological balance and guarantee the sustainable use of natural resources, (Gbadegesin & Gbadamosi, 2024). Sacred forest preservation, communal land management, controlled forest resource harvesting, wetland preservation, customary laws governing resource extraction and community-based biodiversity conservation are some of these practices. In the past, these native conservation strategies have helped to preserve ecological stability, safeguard wildlife habitats and reduce environmental deterioration. By encouraging community involvement, raising environmental awareness and supporting group conservation efforts among their members, co-operative societies are increasingly supporting these practices. Co-operative societies promote sustainable management of forests, water bodies and agricultural lands while enhancing environmental stewardship through these initiatives (Uba, 2025). Incorporating indigenous environmental conservation practices into co-operative activities offers an efficient community-based mechanism for mitigating climate change in Nigeria (Mbalisi & Nwaiwu, 2025).

In order to minimize the long-term effects of climate change, intentional measures to lower greenhouse gas emissions or increase natural ecosystems' ability to absorb atmospheric carbon are referred to as climate change mitigation (Leal Filho *et al.* 2025). Reducing environmental degradation, protecting biodiversity, advancing sustainable land management and supporting ecologically conscious production and consumption methods are all examples of effective mitigation strategies. Increasing evidence indicates that integrating indigenous knowledge with institutional support mechanisms can greatly improve mitigation outcomes, especially in rural communities where traditional knowledge is still widely practiced, even though contemporary scientific interventions are still essential (Promise & Okpoko, 2025). Because they encourage group learning, coordinated action and the broad dissemination of sustainable practices among

community members, co-operative societies offer a suitable institutional framework for incorporating indigenous knowledge into environmental management (United Nations Development Programme [UNDP], 2023).

Discussions aside, Nigeria's efforts to mitigate climate change still primarily rely on scientific and technological interventions, with comparatively little integration of locally developed knowledge systems. Indigenous agricultural and environmental conservation practices that have historically supported ecological sustainability within rural communities are often neglected in favor of modern technologies in national environmental policies and climate adaptation programs (Hassan, 2025). Additionally, the institutional role of co-operative societies in encouraging the use of indigenous knowledge for climate change mitigation has not been sufficiently taken into account in the majority of empirical studies that have already been conducted. Comparatively few studies have explicitly examined how co-operative societies support the use of indigenous environmental conservation and agricultural methods as complementary strategies for tackling Nigeria's climate change challenges.

These limitations highlight significant conceptual and empirical gaps that need more research. In light of this, the current study examines how Nigerian co-operative societies use indigenous knowledge to mitigate the effects of climate change. In particular, the study looks at how using indigenous agricultural practices by co-operative societies affects climate change mitigation, as well as how using indigenous environmental conservation practices by agricultural co-operative societies affects climate change mitigation. By analyzing these connections, the study aims to offer empirical proof of how co-operative societies can function as successful community-based organizations for advancing indigenous knowledge systems that bolster environmental sustainability, improve climate resilience and aid in Nigeria's sustainable mitigation of climate change.

MATERIALS AND METHODS

Research Design and Study Area

The study adopted a descriptive survey research design because it facilitated the collection of field data without manipulating the study variables. According to Creswell (2018), the descriptive survey design is appropriate for studies in which variables cannot be controlled or manipulated, as it enables researchers to systematically obtain information from respondents within their natural settings. He further posits that the design is particularly useful for examining attitudes, behaviours, perceptions and outcomes among populations, especially in social science and agricultural research. The study was conducted in Enugu State, Nigeria, which is located between latitude 6°27'30.1176" N and longitude 7°32'47.0004" E (Ndulue *et al.*, 2021). The State has an estimated population of 5,112,158 inhabitants, according to the Nigeria Population Projections and Demographic Indicators (2025), making it an appropriate setting for investigating the phenomenon under study.

Sampling Size and Sampling Procedure

The Cochran 1963 statistical formula was used to determine the sample size of the study. The formula allows a researcher to calculate an ideal sample size given a desired level of precision, desired confidence level and the formula is given below:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

n = Sample Size

n_o = Representative Sample for Proportion

N = Total Population = 5,112,158

Z^2 = The abscissa of the normal curve = 1.96

p = Proportion of success in the population from pilot survey = 0.5

q = Proportion of failure in the population from pilot survey = 0.5

e = error limit = 0.05

$$n_o = \frac{(1.96)^2 (0.5 \times 0.5)}{(0.05)^2}$$

$$n_o = \frac{3.8416 \times 0.25}{0.0025}$$

$$n_o = 384.16$$

$$n = \frac{384.16}{1 + \frac{(384.16 - 1)}{5,112,158}}$$

$$n = \frac{384.16}{1 + \frac{383.16}{5,112,158}}$$

$$n = \frac{384.16}{1 + 0.0000759507}$$

$$n = \frac{384.16}{1.0000759507}$$

Therefore, $n = 384$

Sampling Procedure

To guarantee both representativeness and practicality in the selection of participants throughout Enugu State, the study used a multistage sampling technique. Enugu State was purposefully divided into its three senatorial zones during the first phase. In order to ensure that the entire state was sufficiently represented both geographically and administratively, this stratification was crucial, as every senatorial district has unique sociocultural and environmental traits that affect how communities view and use indigenous knowledge to address climate change issues. This stage is justified by the senatorial zones' status as official political and administrative borders recognized by organizations like the National Population Commission (NPC) and the Independent National Electoral Commission (INEC). In the second phase, a community was conveniently chosen from each of the agricultural zones. At the final stage, 128 farmers from each community were randomly selected to make up the sample size, which came to 384. The selection process sought to identify places where people actively engage with their surroundings and where indigenous knowledge systems are still in use. In order to enable meaningful comparisons across various local settings, the overall goal was to obtain a sample that reflects both the spatial distribution of communities and the diversity of indigenous knowledge systems used in addressing climate change challenges. See table below 1:

Table 1: Sampling Procedure

Senatorial Zone	Agricultural Zone	Sample
Enugu East	Enugu	128
Enugu North	Nsukka	128
Enugu West	Awgu	128
Total		384

Source: Fieldwork, 2026.

Instrument, Validity, Reliability and Analysis Method

A structured questionnaire was employed as the primary instrument for data collection. The instrument was subjected to face and content validity by experts to ensure that its items adequately represented the study objectives and accurately measured the constructs under investigation. To establish its reliability, a pilot study was conducted outside the main study area using respondents with characteristics similar to those of the target population. The internal consistency of the instrument was determined using Cronbach's Alpha, which yielded a reliability coefficient of 0.88, indicating that the instrument was sufficiently reliable for the study. Data were analyzed using descriptive statistics, specifically the mean, based on a 4-point Likert scale, with the aid of the Statistical Package for the Social Sciences (SPSS) Version 28. A mean criterion of 2.50 was adopted for decision-making; thus, mean values of 2.50 and above were accepted, whereas mean values below 2.50 were rejected.

RESULTS AND DISCUSSION

The study found that the utilization of indigenous agricultural practices by agricultural co-operative societies contributes to climate change mitigation to a high extent, as evidenced by the aggregate mean ($\bar{x}$) of 2.792. Specifically, respondents acknowledged the promotion of climate-smart crop rotation, agroforestry, organic manure application, indigenous weather forecasting and sustainable farming practices as important mechanisms for mitigating climate change. This finding agrees with Akinsemolu *et al.* (2025), who reported that indigenous agricultural practices improve ecosystem resilience, conserve biodiversity and enhance sustainable agricultural productivity through environmentally friendly farming methods. The finding is also consistent with Ekeogu *et al.* (2025), who established that agricultural co-operative societies facilitate the transfer of indigenous farming knowledge that reduces greenhouse gas emissions and strengthens farmers' adaptive capacity to climate variability. Similarly, the result corroborates Inkani *et al.* (2025), who found that traditional agricultural practices such as agroforestry, mixed cropping and indigenous seed preservation significantly improve climate resilience among rural farming households. The present study extends existing knowledge by demonstrating that agricultural co-operative societies function not only as economic institutions but also as effective platforms for preserving and disseminating indigenous agricultural knowledge that supports climate change mitigation in Nigeria. The observed finding may be attributed to the continuous interaction among co-operative members, regular extension services, farmers' field demonstrations and collective learning mechanisms that encourage widespread adoption of environmentally sustainable indigenous agricultural practices.

The study further revealed that the utilization of indigenous environmental conservation practices by agricultural co-operative societies contributes to climate change mitigation to a high extent, with an aggregate mean ($\bar{x}$) of 2.783. Respondents particularly recognized community tree planting, protection of sacred forests, sustainable forest resource harvesting, traditional natural resource management and community participation in environmental conservation as effective climate change mitigation strategies. This finding agrees with Gbadegesin and Gbadamosi (2024), who found that indigenous environmental conservation practices play significant roles in preserving biodiversity, reducing environmental

degradation and promoting sustainable natural resource management. The finding also supports Uba (2025), who established that indigenous conservation institutions, particularly sacred forests and traditional ecological governance systems, contribute substantially to ecosystem protection and environmental sustainability. Likewise, the result aligns with Mbalisi and Nwaiwu (2025), who concluded that integrating indigenous environmental knowledge into community development initiatives significantly enhances ecological resilience and climate change mitigation. This study extends the existing literature by empirically demonstrating that agricultural co-operative societies provide an effective institutional framework through which indigenous environmental conservation practices are collectively promoted and sustained for climate change mitigation in Nigeria. The finding may be explained by the ability of agricultural co-operative societies to mobilize community participation, strengthen environmental awareness, encourage compliance with traditional conservation practices and facilitate collective management of natural resources, thereby improving environmental sustainability and resilience against climate change.

Table 2 How Indigenous Agricultural and Indigenous Environmental Conservation Practices by Agricultural Co-operative Societies Affect Climate Change Mitigation

Indigenous Agricultural and Climate Change Mitigation	$\bar{x}$	Indigenous Environmental Conservation and Climate Change Mitigation	$\bar{x}$
Promote climate-smart crop rotation practices	2.789	Promote community tree planting initiatives	2.803
Encourage biodiversity through mixed cropping	2.753	Protect sacred forests and biodiversity	2.846
Promote sustainable agroforestry farming practices	2.854	Promote indigenous soil conservation practices	2.719
Encourage organic manure application practices	2.798	Encourage sustainable forest resource harvesting	2.896
Preserve indigenous drought-resistant crop varieties	2.733	Promote traditional natural resource management	2.773
Encourage traditional water conservation practices	2.725	Encourage indigenous wetland conservation practices	2.739
Disseminate indigenous seasonal weather knowledge	2.832	Educate environmental stewardship through traditions	2.73
Strengthen sustainable indigenous farming practices	2.851	Strengthen community environmental conservation participation	2.761
Aggregate	2.792		2.783

Fieldwork, 2026 via SPSS, 28.

CONCLUSION AND RECOMMENDATIONS

Through the use of traditional agricultural and environmental conservation techniques, agricultural co-operative societies greatly contribute to the mitigation of climate change. Agricultural co-operative societies improve ecosystem resilience, promote active community involvement in sustainable resource management and strengthen environmental sustainability by facilitating the preservation, sharing and application of indigenous knowledge. The results also show that incorporating indigenous knowledge into co-operative activities offers a workable, community-driven, and sustainable way to address climate change issues while promoting long-term ecological balance, agricultural productivity and sustainable rural development in Nigeria. Through programs for training indigenous knowledge, the government should support agricultural co-operatives and increase community involvement in climate mitigation

initiatives. Through ongoing member education and co-operative environmental initiatives across the country, agricultural co-operative societies should institutionalize indigenous conservation practices. By illustrating how agricultural co-operative societies institutionalize indigenous agricultural and environmental conservation practices as complementary mechanisms for bolstering climate change mitigation in Nigeria, the study closed the empirical gap.

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