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Evaluation of the Role of Indigenous Knowledge in Biodiversity Conservation among Arable Crop Farmers in Southern Taraba, Taraba State, Nigeria

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Abstract

Biodiversity conservation is critical in agricultural systems where rural livelihoods depend heavily on natural resources. This study evaluated the role of indigenous knowledge in biodiversity conservation among arable crop farmers in Southern Taraba, Taraba State, Nigeria. Multistage and proportional sampling techniques were used to select 103 respondents from Wukari, Takum, and Donga local government areas. Data were collected using a structured questionnaire and analyzed using descriptive statistics and Likert-scale ratings. Respondents were generally young to middle-aged; 53.4% were married, and 59.2% had tertiary education. Reported institutional constraints included inadequate extension services (77.7%), limited access to credit (68.9%), and low cooperative membership (53.4%). Awareness of biodiversity-related factors was generally high, with the contribution of forest trees to soil fertility receiving the highest mean rating (M = 4.00). Respondents identified tree cutting for fuelwood (M = 4.00), hunting wild animals (M = 3.63), forest clearing for farming (M = 3.49), and bush burning (M = 3.47) as contributors to biodiversity loss. The findings indicate that considerable indigenous knowledge and conservation awareness coexist with inadequate institutional support. The study provides evidence to inform conservation initiatives that recognize farmers' knowledge while addressing constraints on sustainable agricultural practices. It recommends strengthening extension services, improving access to credit, promoting cooperative formation, and integrating indigenous knowledge with modern conservation strategies to support biodiversity preservation in the study area.

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Keywords: Indigenous Knowledge; Biodiversity Conservation; Arable Crop Farmers; Institutional Support; Nigeria

INTRODUCTION

Biodiversity, or biological diversity, refers to the variety and variability of all living organisms on Earth, encompassing the diversity within species, between species, and of ecosystems (Convention on Biological Diversity (CBD, 2020). It includes every form of life from the smallest microorganisms to the largest animals and plants, as well as the complex ecological systems they form. Biodiversity provides the fundamental basis for the functioning of ecosystems and the services they render, which are essential for human survival. These ecosystem services include food production, climate regulation, soil fertility, nutrient cycling, and water purification (Food and Agriculture Organization (FAO, 2022).

The stability of the planet's ecological systems and consequently the well-being of human societies depends on the continued existence of this biological wealth. Globally, biodiversity depletion has emerged as one of the most pressing environmental issues of the 21st century. Scientists warn that the current rate of species extinction is between 100 and 1,000 times higher than the natural background extinction rate, largely due to anthropogenic pressures (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019). This unprecedented rate of loss has led some scholars to refer to the present period as the "sixth mass extinction.

However, Nigeria has witnessed rapid biodiversity decline due to deforestation, habitat fragmentation, illegal logging, overgrazing, and unregulated land conversion. According to the World Bank (2020), Nigeria has lost more than half of its forest cover since 1990. Studies reveal that states such as Cross River, Taraba, and Ondo, once biodiversity-rich, are now experiencing severe ecological degradation resulting from uncontrolled logging and agricultural expansion (Nigerian Conservation Foundation (NCF, 2022).

Biodiversity has become a critical component of environmental sustainability and agricultural development, particularly in developing countries where rural livelihoods depend heavily on natural resources and ecosystem services. Biodiversity provides essential ecological functions such as soil fertility enhancement, nutrient cycling, pollination, pest and disease regulation, water conservation, and climate regulation. These ecosystem services are

fundamental to maintaining ecological balance, food security, and sustainable livelihoods. However, biodiversity depletion has emerged as a major global environmental concern, attracting increasing attention from scientists, policymakers, and international organizations because of its far-reaching consequences on ecological stability, human welfare, and sustainable development (Food and Agriculture Organization (FAO, 2022; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019). This study is significant because it provides a clear understanding of the role of indigenous knowledge in biodiversity conservation among arable crop farmers in Southern Taraba, Taraba State, Nigeria. Indigenous knowledge constitutes an important component of rural livelihood systems and has long been used by farming communities to manage natural resources sustainably. The aim of this study was to evaluate the role of indigenous knowledge in biodiversity conservation among arable crop farmers in Southern Taraba State, Nigeria. While the specific objectives were to; describe the socio-economic characteristics of arable crop farmers in the study area; examine the level of awareness of biodiversity factors among arable crop farmers; and to identify the major indigenous farming practices that causes biodiversity depletion among the respondents in the study area.

METHODOLOGY

Study Area

The study was conducted in Southern Taraba, Taraba State, Nigeria. The area lies within the tropical zone and is characterized by a mixture of vegetation types, undulating terrain, fertile soils, and numerous river systems. Southern Taraba comprises five Local Government Areas (LGAs), namely Wukari, Takum, Donga, Ussa, and Ibi. Southern Taraba is located approximately between latitude 6°25'N and 7°50'N and longitude 9°30'E and 11°00'E. It shares boundaries with Benue State to the west, Adamawa State to the northeast, and the Republic of Cameroon to the southeast. The area covers a vast landmass, with a population largely dependent on agriculture and natural resource use (National Population Commission (NPC, 2023).

Source of Data

Primary data were collected for this study through the administration of a structured questionnaire to the selected arable crop farmers in Wukari, Takum, and Donga Local

Government Areas (LGAs) of Southern Taraba, Taraba State, Nigeria. The questionnaire was designed in accordance with the objectives of the study and contained questions relating to the socio-economic characteristics of the respondents, awareness of biodiversity factors, and causes of biodiversity depletion, indigenous farming practices.

Sampling Technique

Multistage and proportional sampling technique were employed to ensure adequate representation of arable crop farmers in Southern Taraba. The study covered three selected Local Government Areas (LGAs), namely Wukari, Takum, and Donga. The population of the study consisted of 1,200 arable crop farmers obtained from relevant sources within the study areas. The population comprised 450 farmers from Wukari, 400 farmers from Takum, and 350 farmers from Donga. The first stage involved the purposive selection of Wukari, Takum, and Donga LGAs based on their high levels of agricultural activities and prominence in arable crop production. The second stage involved the random selection of four (4) communities from each of the three selected LGAs, resulting in a total of twelve (12) communities. In the third stage proportional sampling was then employed to compute 103 porpulation of the arable crop farmers, thereby giving a sample size of 103 respondents for the study.

Method of Data Analysis

The data collected from the field were analyzed using both descriptive and inferential statistical tools to effectively achieve the stated objectives. Descriptive statistics were used to achieve Objective I. A Likert scale was used to achieve Objectives II and III.

Model Specification

Descriptive statistics model (mean)

$$\bar{x} = \frac{\sum_{i-1}^{n} fixi}{\sum_{i=1}^{n} fi}$$

$\bar{x} =$ arithemetic mean of grouped data

$xi =$ mid point of the class interval

$fi =$ frequency

$n =$ total number of class interval

Standard deviation (SD)

$$\mathcal{S} = \sqrt{\frac{\sum_{i=1}^{n}(\chi_i - \bar{\chi})^2}{n-1}}$$

$\mathcal{S} = sample\ starndard\ deviation$

$\chi_i = each\ observtion\ in\ the\ sample$

$\bar{\chi} = sample\ mean$

$n = number\ of\ observation\ in\ the\ sample$

Likert-Scale Rating Technique for Measuring Awareness of Biodiversity

A four-point Likert scale was used in this study to measure the factors influencing awareness of biodiversity among arable crop farmers in Southern Taraba, Taraba State, Nigeria. The scale was used to obtain respondents' perceptions and level of awareness regarding biodiversity conservation, indigenous knowledge and the sustainable management of agricultural and natural resources.

The respondents were presented with statements relating to the important of biodiversity factors and were asked to indicate their level of awareness of each factor. The grading was in the following order:

Response	Score
Extremely Aware (EA)	4
Aware (A)	3
Not Sure (NS)	2
Fully Not Aware (FNA)	1

The values of the four-point Likert scale were added to obtain 10 and divided by 4 to determine the mean cut-off point:

(4+3+2+1=10/4=2.50)

Therefore, the cut-off point was 2.50. The mean score of each biodiversity factor was calculated from the responses of the farmers. A mean score greater than or equal to 2.50 was categorized as Extremely Aware, while a mean score less than 2.50 was categorized as Fully Not Aware.

RESULT AND DISCUSSION

Socio-economic Characteristics of Arable Crop Farmers

The socio-economic profile of the 103 respondents presents a demographic and institutional context that aligns with common findings in agricultural studies, particularly regarding factors that influence innovation adoption and productivity (Rogers, 2003). The data shows a predominantly young to middle-aged farmer population, with the mean age falling in the 30-39 years category a demographic that Mendola (2007) and Nwaru (2004) associate with both the physical capacity for farming and a greater openness to innovative practices. The high proportion of married individuals (53.4%) and the significant educational attainment, with nearly 60% having tertiary education, are notable characteristics. This education level is a critical factor, as Feder et al. (1985) and Akudugu et al. (2012) frequently cite it as a key positive determinant for adopting new technologies, accessing information, and participating in cooperative societies. The average farming experience, with most respondents having between 6-10 years of practice, indicates a relatively experienced workforce; however, as Asfaw and Admassie (2004) caution, while experience brings valuable local knowledge, it can also lead to a reliance on traditional methods and resistance to change if not complemented by external inputs.

Despite this favorable human capital profile, the table reveals severe institutional bottlenecks that corroborate findings from several studies. A staggering 68.9% of respondents lack access to credit, a constraint that Diagne et al. (2000) and Ololade and Olagunju (2013) identify as a primary barrier to capital investment and the adoption of improved farm practices. Furthermore, 77.7% have no contact with extension services and 53.4% are not cooperative members, indicating a critical gap in information and support systems a situation that Swanson and Rajalahti (2010) argue undermines technology transfer and rural development. While Wollni et al. (2010) and Abebaw and Haile (2013) demonstrate that cooperative membership and extension access can significantly improve productivity and food security, the low uptake here suggests structural deficiencies in these service provisions. This represents a major barrier to translating the respondents' relatively high education and experience into enhanced agricultural outcomes, a conclusion consistent with the institutional constraints highlighted by Olayide et al. (2016) in their analysis of Nigerian agricultural systems.

Table 1: Socio-economic Characteristic of the Respondents (n=103)

Socio-economic	Frequency	Percent	Mean (Std Deviation)
Age			
less than 20yrs	12	11.7	
20-29	26	25.2	
30-39	34	33	
40-49	21	20.4	
50 and above	10	9.7	**2.91(±1.147)**
Gender			
Male	64	62.1	
Female	39	37.9	
Marital Status			
Single	40	38.8	
Married	55	53.4	
Widowed	6	5.8	
Divorced	2	1.9	
Educational level			
No for Formal Education	8	7.8	
Primary	8	7.8	
Secondary	26	25.2	
Tertiary	61	59.2	
Farming Experiences			
1-5yrs	27	26.2	
6-10yrs	31	30.1	
11-15yrs	22	21.4	
16yrs and above	23	22.3	**2.40(±1.106)**
Household Size			
1-3prs	38	36.9	
4-6prs	31	30.1	
7-9pers	25	24.3	
10person and above	9	8.7	**205(±984)**
Farm Size			
less than hectare	35	34	
1-2 hecs	43	41.7	
3-4 hec	15	14.6	
5-6 hecs	7	6.8	
7-8 hecs	1	1	
9 and above	2	1.9	**2.05(±1.079)**
Cooperative Membership			
Yes	48	46.6	
No	55	53.4	
Access to Credit			
Yes	32	31.1	
No	71	68.9	
Access to Extension Services			
Yes	23	22.3	
No	80	77.7	

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The Level of Awareness of Biodiversity Factors Among Arable Crop Farmers

The table reveals a compelling hierarchy in farmers' biodiversity awareness, with the highest recognition (mean = 4.00) given to the role of forest trees in enhancing soil fertility. This finding strongly aligns with established research across sub-Saharan Africa, which consistently documents that farmers possess significant indigenous knowledge about the soil-enriching properties of certain tree species within agroforestry systems (Ajayi *et al.*, 2007; Kiptot *et al.*, 2006). This practical, productivity-linked knowledge appears to form the foundation of their environmental awareness, as farmers prioritize ecological elements that directly sustain their crop yields.

High awareness also extends to conservation practices such as restricting hunting and protecting endangered species (mean = 3.63) and the utilitarian and cultural roles of plants (mean = 3.54). This suggests an awareness that integrates both ecological protection and the direct socio-economic value of biodiversity, reflecting what Mbata (2004) described as a community-based understanding where biodiversity is tied to food security and cultural identity. Similarly, Okigbo (2009) emphasized that Nigerian farmers often perceive biodiversity through the lens of its immediate contributions to dietary diversity and traditional medicine, which explains the elevated awareness scores for these indicators.

However, awareness scores gradually decline for indicators of biodiversity loss, with the extinction of animal species ranking lowest (mean = 3.27). This pattern may indicate that while farmers are acutely aware of the immediate, observable benefits of biodiversity for their livelihoods, their awareness of the more gradual, long-term threats like species extinction is slightly lower. Oba *et al.* (2008) noted that local knowledge of species decline often lags behind actual ecological changes, particularly when farmers face pressing challenges such as lack of funds, climate variability, and market pressures, which can divert attention from long-term conservation goals. Furthermore, Akinbile and Ogunwale (2011) argued that extension education programmes in Nigeria have historically focused more on crop productivity than on biodiversity conservation, which may partly explain the relatively lower awareness of animal species extinction compared to soil fertility indicators.

Table 2: Level of Awareness of Biodiversity Awareness Among Arable Crop Farmers

Biodiversity Awareness Indicators	Mean	Std. Deviation	Decision	Rank
Role of forest trees in enhancing soil fertility	4.00	0.000	Extremely Aware	1
Restriction of hunting and harassment of endangered species	3.63	0.485	Extremely Aware	2
Use of plants for dietary and cultural needs	3.54	0.538	Extremely Aware	3
Extinction of plant species in the area	3.45	0.573	Extremely Aware	4
Seasonality in hunting, fishing, and harvesting crops	3.44	0.621	Extremely Aware	5
Importance of microorganisms in the soil	3.42	0.569	Extremely Aware	6
Extinction of some animal species in the area	3.27	0.613	Extremely Aware	7

Field Survey 2026

Indigenous Farming Practices Influencing Biodiversity

Table 3 shows that arable crop farmers strongly agree that most indigenous farming practices contribute to biodiversity loss, with all mean scores above 2.50. Cutting trees for fuelwood ranks highest (mean = 4.00), reflecting the dominant role of wood dependence in deforestation, as similarly observed by Adebayo and Oruonye (2013) in rural Nigerian communities. Hunting of wild animals (mean = 3.63), forest clearing for farming (mean = 3.49), and bush burning (mean = 3.47) also rank highly, consistent with Fa and Brown (2009) and Ekanade and Odebiyi (2014), who identified these practices as major drivers of habitat destruction and species decline in West Africa.

Moderate agreement is recorded for continuous cropping, expansion into natural vegetation, and use of agro-chemicals (means ranging from 3.27 to 3.45), supporting Tilman *et al.* (2002) argument that agricultural intensification undermines soil and biological diversity. The lowest-ranked practices poor waste disposal (2.84), overgrazing (2.78), and excessive tillage (2.54) received only "Agree" decisions, possibly because these are less prevalent or less visible in the study area, a pattern noted by Giller *et al.* (2009) regarding the varied adoption of harmful practices across farming systems.

Overall, the table indicates that farmers possess considerable awareness of biodiversity-threatening practices, particularly those with immediate observable effects, while awareness diminishes for less conspicuous impacts like tillage and waste disposal. This

underscores the need for targeted extension education promoting sustainable alternatives such as agroforestry and conservation agriculture, as advocated by Pretty *et al.* (2006).

Table 3: Table Indigenous Farming Practices Contributing to Biodiversity Loss Among Arable Crop Farmers

Indigenous Farming Practices	Mean	Std. Deviation	Decision	Rank
Cutting of trees for fuelwood	4.00	0.000	Strongly Agree	1
Hunting or trapping of wild animals	3.63	0.485	Strongly Agree	2
Clearing forest for farming	3.49	0.502	Strongly Agree	3
Bush burning	3.47	0.557	Strongly Agree	4
Continuous cropping	3.45	0.573	Strongly Agree	5
Expansion into natural vegetation	3.42	0.569	Strongly Agree	6
Use of agro-chemicals	3.27	0.613	Strongly Agree	7
Poor waste disposal on farmland	2.84	0.958	Agree	8
Overgrazing by livestock	2.78	1.009	Agree	9
Excessive tillage practices	2.54	1.055	Agree	10

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CONCLUSION

Based on the research findings, this study concludes that arable crop farmers in Southern Taraba possess a high level of awareness regarding biodiversity conservation, particularly when it is directly linked to their agricultural productivity, such as the role of forest trees in enhancing soil fertility. However, this awareness coexists with the widespread use of indigenous farming practices including tree cutting, bush burning, and hunting that significantly contribute to biodiversity loss. The study further identifies critical institutional constraints, notably limited access to credit, extension services, and cooperative membership, which hinder the adoption of sustainable alternatives. Ultimately, while indigenous knowledge remains integral to local farming systems, its current application often undermines biodiversity. Therefore, effective conservation efforts must integrate this knowledge with targeted policy interventions, improved institutional support, and extension education that promotes sustainable agricultural practices to balance productivity with ecological preservation in the region.

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