UKR Journal of Agriculture and Veterinary Sciences (UKRJAVS)
Homepage: https://ukrpublisher.com/ukrjavs/
Email: submit.ukrpublisher@gmail.com
Volume 2, Issue 3 (May-June) 2026
ISSN: 3107-6173 (Online)

Effect of Biodiversity on Crop Productivity among Arable Crop Farmers in Southern Taraba, Taraba State, Nigeria

Danlami, A.[1], Gizaki, J. L.[2], & Mba, R.[3]

Department of Agricultural Economics and Extension, Federal University Wukari, Taraba State, Nigeria.

***Corresponding Author**: Danlami, A.

DOI: *https://doi.org/10.5281/zenodo.22747275*

Article History

Original Research Article

Received: 09-07-2026

Accepted: 17-08-2026

Published: 14-09-2026

Citation: Danlami, A., Gizaki, J. L., and Mba, R. (2026). Effect of Biodiversity on Crop Productivity among Arable Crop Farmers in Southern Taraba, Taraba State, Nigeria. UKR Journal of Agriculture and Veterinary Sciences (UKRJAVS), 2(3), 31-40.

ABSTRACT

This study assessed the effect of biodiversity on crop productivity among arable crop farmers in Southern Taraba, Taraba State, Nigeria. The specific objectives were to describe the socio-economic characteristics of arable crop farmers, assess farmers' level of awareness of biodiversity conservation practices, and determine the effect of biodiversity on crop productivity. A multistage sampling technique was used to select 112 respondents from Wukari, Takum, and Donga Local Government Areas of Taraba State. Data were collected using structured questionnaires, of which 103 valid responses were retrieved and analyzed. Descriptive statistics and logistic regression were used for data analysis. The results showed that the majority of the respondents were male, married, economically active, and had formal education. Farmers demonstrated a high level of awareness of biodiversity conservation practices, with a grand mean score of 3.25. The logistic regression results revealed that the presence of trees on farmland ($B = 2.467$, $p \leq 0.05$) and the adoption of soil moisture conservation practices ($B = 1.972$, $p \leq 0.05$) had significant positive effects on crop productivity. The study concluded that biodiversity conservation practices, particularly the retention of trees on farmland and soil moisture conservation, contribute positively to crop productivity among arable crop farmers in Southern Taraba. It was recommended that farmers should be encouraged to adopt and sustain biodiversity-friendly farming practices, while agricultural extension services should be strengthened to provide farmers with appropriate knowledge and technical support on biodiversity conservation and sustainable crop production.

Keywords: *Biodiversity; Crop Productivity; Arable Crop Farmers; Biodiversity Conservation; Southern Taraba.*

INTRODUCTION

Biological diversity implies 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." Biodiversity loss undermines ecological resilience, reduces the genetic resources available for food and medicine, and limits ecosystems' ability to recover from disturbances such as droughts, floods, and disease outbreaks (United Nations Environment Programme [UNEP], 2021).

The Biodiversity Targets are part of the Strategic Plan for Biodiversity (2011–2020) developed under the Convention on Biological Diversity (CBD). There are 20 global targets organized under five strategic goals aimed at halting biodiversity loss and promoting sustainable use. Strategic Goal A addresses the underlying causes of biodiversity loss, while Goal B focuses on reducing the direct pressures on biodiversity. The Aichi Biodiversity Targets for 2020 were not fully achieved by the deadline. The world made some progress, but none of the targets were fully achieved by 2020, while only six targets were partially achieved and progress on many others remained limited or negligible. Major global drivers of biodiversity loss include land-use change, agricultural expansion, deforestation, overexploitation of natural resources, pollution, invasive species, and climate change (FAO, 2020). Agricultural expansion alone accounts for almost 80 percent of global deforestation, especially in tropical regions (FAO, 2021). Africa is particularly vulnerable to biodiversity loss due to high dependency on natural resources for livelihoods. The continent hosts vast tropical forests, savanna grasslands, wetlands, and deserts, supporting unique flora and fauna species. However, rapid population growth, poverty, and increasing pressure on land have intensified the exploitation of natural ecosystems (African Union, 2021). Recent estimates show that Africa lost about 3.9 million hectares of forest annually between 2010 and 2020, the highest rate globally (FAO, 2022).

Statement of the Research Problem

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). In many rural communities, indigenous knowledge has historically played an important role in biodiversity conservation and natural resource management. Indigenous knowledge consists of the cumulative body of knowledge, beliefs, practices, and innovations developed by local communities through long-term interaction with their environment. Such knowledge is transmitted across generations and often guides the sustainable utilization and conservation of biological resources. Traditional conservation practices such as mixed cropping, agroforestry, bush fallowing, traditional seed preservation, indigenous pest control, seasonal harvesting, and protection of culturally important species have contributed significantly to biodiversity conservation and environmental sustainability.

Objectives of the Study

The broad objective of this study was to estimate the effect of biodiversity on crop productivity among arable crop farmers in Southern Taraba State, Nigeria. The Specific Objectives were to:

1. Describe the socio-economic characteristics of arable crop farmers in the study area.

2. Determine the effect of biodiversity on crop productivity.

METHODOLOGY

Study Area

The study was conducted in Southern Taraba, Taraba State, Nigeria, one of the most ecologically diverse regions in the northeastern part of the country. 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. Figure 2 shows that Wukari, Donga, and Takum LGAs were purposively selected as the study areas because of their prominence in arable crop production and the relevance of biodiversity resources to agricultural activities and livelihoods. The highlighted areas in the map represent the geographical coverage of the study, each with distinct ecological and socio-cultural features (Taraba State Government, 2023). 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). The climate of the region is tropical wet and dry, with two distinct seasons: the rainy season (April to September) and the dry season (October to March). Annual rainfall ranges between 1,200 mm and 2,000 mm, while average temperatures range from 25°C to 33°C (Nigerian Meteorological Agency [NiMet], 2022). The inhabitants of Southern Taraba are predominantly engaged in farming, hunting, and trading. Major ethnic groups in the area include the Jukun, Tiv, Kuteb, Chamba, and Ichen, each with unique cultural practices related to natural resource use (Ibrahim, 2021).

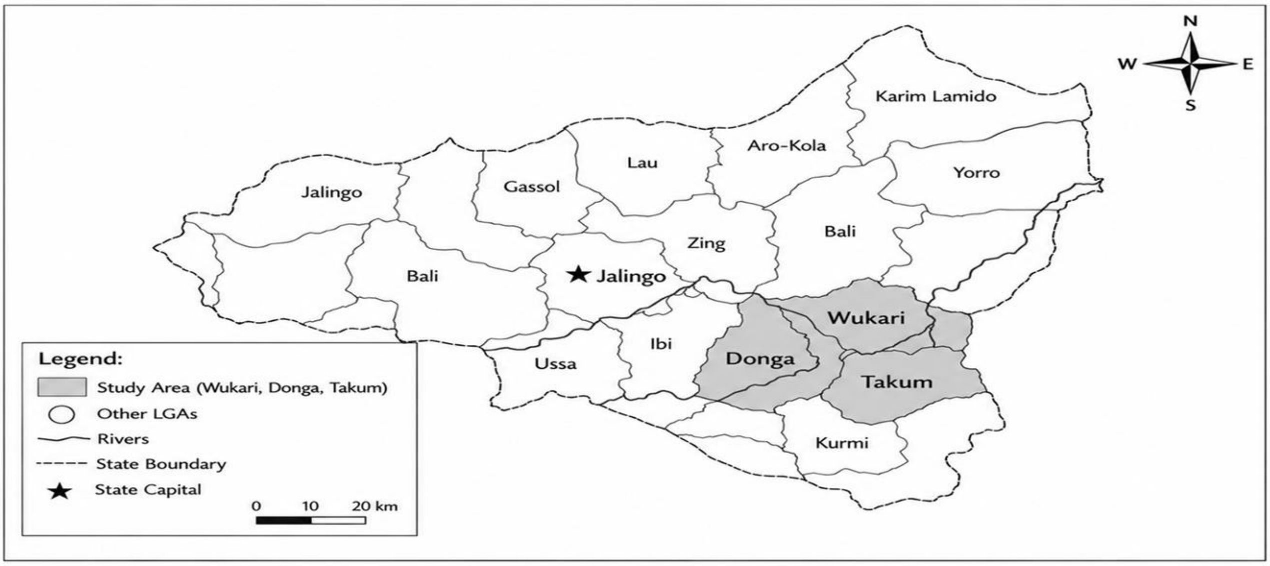

Figure 2: Map of Taraba State Showing the Study Area (Wukari, Donga, and Takum LGAs)

Source: Adapted from UNHCR (2019) and Adenubi et al. (2020).

Method of Data Collection

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, causes of biodiversity depletion, indigenous farming practices, and the effects of biodiversity on crop productivity. The questionnaire was administered directly to the selected respondents with the help of some friends.

Sampling Procedure and Sample Size

Multistage and proportional sampling techniques 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.

The sample size was determined using the Taro Yamane (1967) formula:

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

Where:

n= required sample size
N= total population (1,200)
e= level of precision (0.09)

Substituting the values:

$$n = \frac{1200}{1 + 1200(0.09)^2}$$

$$n = \frac{1200}{1 + 1200(0.0081)}$$

$$n = \frac{1200}{1 + 9.72}$$

$$n = \frac{1200}{10.72}$$

$$n \approx 112$$

Thus, the sample size for the study was 112 respondents, which was considered adequate for achieving reliable and representative results.To ensure fair representation, the sample size was proportionately distributed across the three selected LGAs based on their respective population sizes using:

$$n_i = \frac{N_i}{N} \times n$$

Where:

n_i= sample size for each LGA

N_i= population of each LGA

N= total population (1,200)

n= total sample size (112)

Proportional Allocation:

Wukari: $n_1 = \frac{450}{1200} \times 112 = 42$

Takum: $n_2 = \frac{400}{1200} \times 112 \approx 37$

Donga: $n_3 = \frac{350}{1200} \times 112 \approx 33$

Table 3.1: Selected LGAs, Communities, Sampling Frame and sample size

LGA	Villages	Population (N_i)	Sample Size (n_i)	Percentage (%)
Wukari	Chonku	120	11	10
	Byepyi	110	10	9
	Hyuku	115	11	10
	Nwusen	105	10	9
Takum	Bete	110	10	9
	Chanchanji	100	9	8
	Tati	95	9	8
	Kashimbila	95	9	8
Donga	Mararraba	90	8	7
	Suntai	85	8	7
	Nyita	90	9	8
	Nyivu	85	8	7
	Total	**1,200**	**112**	**100**

Field Survey 2026

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 1, while Logit regression was employed to analyse Objective 2.

Model Specification

3.5.1 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

3.5.2 Standard deviation (SD)

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

$S = sample\ starndard\ deviation$

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

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

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

Logistic Regression Model Specification

To determine the effect of biodiversity on crop productivity of arable crop farmers in the study areas, a binary logistic regression model was employed. The model estimated the probability of attaining higher crop productivity as a function of selected biodiversity-related factors and biodiversity-friendly farming practices. The logistic regression model is expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu$$

Where:

Dependent Variable

Y = Crop productivity (Number of improved farming practices adopted)
Independent Variables.

X_1 Crop diversity increase yield Yes=1, No =0

X_2 Presence of trees increases output: Yes = 1, No = 0

X_3 Healthy soil containing living organism Yes = 1, No = 0

X_4 Biodiversity conservation reduce pest Yes=1, No = 0

X_5 Natural vegetation cover maintains soil fertility: Yes = 1, No = 0

X_6 Loss of biodiversity reduces agricultural productivity: Yes=1, No = 0

X_7 Presence of different plant species improves soil moisture: Yes=1, No = 0

X_8 Natural Pest Control Yes=1, No = 0

X_9 Biodiversity reduces erosion Yes=1, No = 0

X_{10} Conservation of forests improves rainfall: Yes = 1, No = 0

β_0= Constant/intercept

$\beta_1 - \beta_{10}$= Regression coefficients

μ= Error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Arable Crop Farmers

The socio-economic characteristics of respondents presented in Table 1 reveal important demographic and farm-related attributes of arable crop farmers in Southern Taraba, particularly in Wukari, Takum, and Donga Local Government Areas. These characteristics play a significant role in shaping farmers' indigenous knowledge systems, farming decisions, and biodiversity conservation practices. Factors such as age, gender, educational level, farming experience, household size, farm size, and access to extension services influence the acquisition, preservation, and transmission of indigenous knowledge related to biodiversity management. They also determine farmers' capacity to utilize traditional ecological knowledge in conserving plant and animal species, maintaining soil fertility, and promoting sustainable agricultural practices. Understanding the socio-economic profile of farmers is therefore essential for evaluating the role of indigenous knowledge in biodiversity conservation and ensuring the sustainability of agricultural production systems. According to Food and Agriculture Organization (FAO, 2021), farmers' socio-economic conditions significant he try determining their ability to adopt sustainable agricultural and biodiversity conservation practices.

Age of the Respondents. The predominance of economically active farmers in the study area may positively influence the preservation and application of indigenous knowledge for biodiversity conservation. Farmers within the active age bracket often possess the physical capacity required for farming activities while also serving as custodians and transmitters of traditional ecological knowledge. Their active involvement in agriculture enables them to apply indigenous practices such as the conservation of useful plant species, protection of sacred groves, mixed cropping, agroforestry, and traditional soil management techniques that contribute to biodiversity conservation and sustainable agricultural production. Furthermore, farmers in this age group are better positioned to combine indigenous knowledge with modern conservation approaches, thereby enhancing the effectiveness of biodiversity management practices. This finding agrees with Ajayi and Solomon (2019), who reported that younger farmers are more receptive to improved agricultural technologies and environmental conservation strategies. Similarly, Nwaru and Onuoha (2018) observed that age significantly influences farmers' adoption of sustainable land management practices.

Gender. The table further indicates that (62.1%) of the respondents were male, while (37.9%) were female. This suggests that male farmers dominated arable crop production and indigenous knowledge-based biodiversity conservation practices in the study area. The result further shows that the majority of the respondents (33.0%) were within the age range of 30–39 years, while (25.2%) were between 20–29 years. Respondents aged 40–49 years constituted (20.4%) whereas (11.7%) were less than 20 years and only (9.7%) were 50 years and above. The mean age was (2.91%) with a standard deviation of ±1.147, indicating that most respondents were relatively young and economically active farmers. This implies that arable crop farming and the application of indigenous knowledge for biodiversity conservation in the study area are dominated by active and productive individuals who are capable of engaging in labor-intensive agricultural activities while maintaining traditional ecological practices that support sustainable resource management. Younger farmers are often more willing to experiment with new technologies and sustainable agricultural innovations such as agroforestry, crop diversification, mulching, organic manure application, and integrated soil fertility management, while also adapting and integrating indigenous knowledge systems into contemporary farming practices.

The dominance of male farmers may be attributed to the labor-intensive nature of arable farming, cultural norms, and traditional land tenure systems that often provide men with greater access to farmland, agricultural inputs, and production resources. In many rural communities of Taraba State, men also play a prominent role in decision-making regarding land use and the implementation of indigenous knowledge practices related to forest resource management, soil conservation, and biodiversity protection. According to FAO (2020), empowering women farmers through improved access to land, extension services, and financial resources can significantly enhance sustainable agricultural production and biodiversity conservation. Similarly, indigenous knowledge held by women contributes substantially to the conservation of agrobiodiversity and the sustainable utilization of natural resources in rural communities. Therefore, inclusive agricultural policies that recognize the contributions of both male and female farmers are necessary for achieving sustainable productivity and strengthening the role of indigenous knowledge in biodiversity conservation among arable crop farmers in the study area.

Marital Status. The result reveals that (53.4%) of the respondents were married, 38.8% were single, while widowed and divorced respondents accounted for (5.8%) and (1.9%), respectively. The predominance of married respondents suggests that family labor may be readily available for farming operations. Married farmers are often more committed to stable agricultural production because of household responsibilities, food security concerns, and the need to provide income for their families. Availability of family labor can reduce dependence on hired labor and facilitate timely farm operations such as planting, weeding, mulching, harvesting, and implementation of biodiversity-friendly practices including crop rotation, intercropping, and agroforestry systems. Furthermore, married households may have stronger social networks and cooperative interactions that support knowledge sharing and collective environmental management practices. According to Ibrahim et al. (2020), marital status influences farmers' participation in sustainable agricultural practices because married farmers are usually more economically responsible and production-oriented.

Educational Level. The educational distribution shows that 59.2% of the respondents attained tertiary education, (25.2%) had secondary education, while only (7.8%) had primary education and another (7.8%) had no formal education. The high level of education among respondents implies that farmers in the study area are relatively literate and capable of understanding the importance of biodiversity conservation and improved agricultural practices. Education plays a significant role in enhancing farmers' managerial abilities, decision-making capacity, and access to agricultural information. Educated farmers are more likely to understand the environmental consequences of unsustainable farming practices such as deforestation, bush burning, excessive chemical application, and over-cultivation. They are also more likely to adopt innovations related to climate adaptation, integrated pest management, soil conservation, organic farming, and agroecological systems. In addition, education improves farmers' ability to access extension services, interpret market information, and utilize modern communication technologies for agricultural development. This finding is consistent with the work of Oyinbo et al.

(2020), who observed that education positively influences technology adoption and sustainable agricultural productivity. Similarly, Abdulai and Huffman (2014) noted that educational attainment enhances farmers' efficiency and productivity through improved resource management and innovation adoption.

Farming Experience. The result indicates that (30.1%) of the respondents had farming experience of 6–10 years, (26.2%) had 1–5 years, (22.3%) had 16 years and above, while (21.4%) had 11–15 years of farming experience. The mean farming experience was 2.40 with a standard deviation of ±1.106. This suggests that most respondents possessed moderate farming experience. Farming experience is an important factor influencing agricultural productivity because experienced farmers are more familiar with local environmental conditions, cropping patterns, pest infestation trends, and soil fertility management practices. Through years of farming activities, farmers acquire indigenous knowledge regarding the conservation and utilization of biodiversity resources for sustainable production. Experienced farmers are better able to recognize the importance of biodiversity in pollination, nutrient cycling, soil fertility improvement, moisture conservation, and natural pest regulation. They are also more capable of adapting farming practices to changing climatic and ecological conditions. According to Yusuf et al. (2019), farming experience positively influences farmers' adoption of sustainable agricultural technologies and environmental management practices.

Household Size The household size distribution reveals that (36.9%) of the respondents had household sizes of 1–3 persons, (30.1%) had 4–6 persons, (24.3%) had 7–9 persons, while only 8.7% had 10 persons and above. Household size influences the availability of family labor for agricultural activities. Larger households may provide additional labor for implementing biodiversity conservation practices such as compost preparation, tree planting, mixed farming, mulching, and erosion control measures. Availability of family labor can reduce production costs and improve efficiency in farm management activities. However, very large households may also increase pressure on available land and natural resources, leading to overexploitation of biodiversity resources. According to Bello et al. (2021), household size significantly affects labor availability and productivity among smallholder farmers in Nigeria. Therefore, optimal household labor availability may contribute positively to biodiversity conservation and agricultural productivity in the study area.

Farm Size. The result shows that (41.7%) of the respondents cultivated between 1–2 hectares of farmland, while (34.0%) cultivated less than one hectare. Only a few respondents cultivated larger farm sizes above 5 hectares. This indicates that arable crop farming in the study area is predominantly small-scale in nature. Smallholder farmers depend heavily on ecosystem services provided by biodiversity, including fertile soils, pollination, rainfall regulation, biological pest control, and nutrient cycling. Due to limited land availability, smallholder farmers often intensify land use, which may either encourage sustainable management practices or lead to environmental degradation if not properly managed. The predominance of small-scale farming highlights the importance of biodiversity conservation in sustaining agricultural productivity and environmental sustainability. According to Altieri (2018), biodiversity-based agricultural systems enhance resilience, improve soil health, and increase productivity among smallholders.

Farmers. Cooperative Membership. The table shows that (53.4%) of the respondents did not belong to cooperative societies, while (46.6%) were cooperative members. Low participation in cooperatives may limit farmers' access to agricultural information, training opportunities, financial assistance, and biodiversity-related innovations. Cooperative societies often serve as important channels for disseminating agricultural technologies, environmental conservation practices, and extension information. Membership in cooperatives also enhances farmers' bargaining power, access to credit facilities, input supply, and market opportunities. Farmers who belong to cooperatives are more likely to participate in training programs related to sustainable agriculture and biodiversity conservation. According to Adewale et al. (2019), cooperative membership positively influences farmers' adoption of improved agricultural practices and access to production resources.

Access to Credit The result reveals that (68.9%) of the respondents had no access to credit facilities, while only (31.1%) had access to credit. Limited access to credit may hinder farmers from investing in improved technologies, organic inputs, soil conservation practices, irrigation facilities, and biodiversity-friendly farming systems. Financial constraints often reduce farmers' ability to purchase quality seeds, fertilizers, agroforestry seedlings, and farm equipment necessary for sustainable production. Lack of credit may also discourage investment in long-term environmental conservation measures that improve soil fertility and biodiversity. Access to agricultural credit enhances farmers' capacity to adopt innovations and expand production activities. According to Obisesan (2014), credit accessibility significantly influences technology adoption and agricultural productivity among rural farmers in Nigeria. Access to Extension Services. The result further indicates that (77.7%) of the respondents had no access to extension services, while only (22.3%) had access. Poor access to extension services suggests inadequate dissemination of agricultural innovations and biodiversity conservation practices in the study area.

Extension agents play important roles in educating farmers on sustainable land management, agroecological practices, integrated pest management, climate-smart agriculture, and biodiversity conservation strategies.

Table 1: Socio-economic Characteristics 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	

Field Survey 2026

Effects of Biodiversity on Crop Productivity

The binary logistic regression model was employed to examine the effects of biodiversity-related factors on agricultural productivity. The coefficients (B), significance values (Sig.), and odds ratios (Exp(B)) explain the direction and strength of the significant variables' effects on productivity. Trees on farmland had a strong positive and statistically significant effect on crop productivity (B = 2.467, > = 0.001). The odds ratio (Exp(B) = 11.783) indicates that respondents practicing tree integration on farmland were about 11.8 times more likely to experience improved productivity. This finding suggests that agroforestry practices contribute substantially to agricultural productivity, likely through improved soil fertility, microclimate regulation, and nutrient cycling. This result aligns with Mbow et al. (2020), Sida et al. (2021), and Rosenstock et al. (2023), who found that agroforestry significantly enhances soil health, carbon storage, and crop productivity in smallholder systems across sub-Saharan Africa.

Soil moisture conservation also emerged as a significant determinant of crop productivity. The positive coefficient (B = 1.972) and significant p-value (p = 0.044) indicate that biodiversity-related practices that promote soil moisture conservation significantly improve agricultural productivity. The odds ratio (Exp(B) = 7.184) means that farmers applying such practices were over seven times more likely to achieve higher productivity compared with those who did not. This finding demonstrates the importance of maintaining soil moisture within farming systems, particularly under rain-fed agricultural conditions were inadequate water availability can constrain crop growth and yield. The result supports the findings of Rockström et al. (2023) and IPCC (2022), which identify soil water retention as one of the most important constraints and determinants of agricultural yield in rain-fed systems. Similarly, IPCC (2022) and FAO (2023) highlight soil moisture conservation as a key component of climate-resilient agriculture and yield stability under increasing drought stress.

Vegetation cover for soil conservation had a statistically significant but negative effect on crop productivity (B = –3.459, > = 0.019). The odds ratio (Exp(B) = 0.031) indicates that farmers associated with vegetation cover for soil conservation were less likely to experience increased productivity, holding other variables constant. Although vegetation cover is generally expected to protect soil from degradation and improve ecosystem functions, the negative relationship observed in this study may reflect context-specific conditions. For example, unmanaged vegetation may compete with crops for water, nutrients, sunlight, and available farmland, thereby reducing crop performance where competition is substantial. Similar trade-offs have been documented in recent agroecological studies by Kremen & Merenlender (2022) and Tscharntke et al. (2021), who noted that unmanaged vegetation can reduce crop performance in intensively cultivated landscapes.

Table 2: Logistic Regression Result of the Effect of Biodiversity on Crop Productivity

	B	S.E.	Wald	Sig.	Exp(B)
Constant	-3.145	2.273	1.914	0.167	0.043
Crop diversity increase yield	0.764	1.056	0.524	0.469	2.147
Trees on farmland improve crop output	2.467	0.746	10.933	0.001***	11.783
Organism improve crop productivity	2.268	1.179	3.697	0.055**	9.656
Reduction in pest improve crop productivity.	-1.106	1.596	0.480	0.488	0.331
Improve soil moisture conservation	3.262	2.057	2.515	0.113	26.102
Biodiversity reduces pests in agriculture	0-.369	1.022	.131	0.718	0.691
Soil moisture conservation enhance crop	1.972	.979	4.058	0.044**	7.184
Reduction in soil erosion promote product	0.530	1.073	.244	0.621	1.699
Vegetation cover for soil conservation	-3.459	1.477	5.485	0.019**	0.031
R	0.403				

Field Survey 2026 ***1%, **5%

CONCLUSION

The study concluded that arable crop farmers in Southern Taraba, Taraba State, possess a relatively high level of awareness of biodiversity factors, particularly regarding the role of forest trees, conservation of endangered species, and the importance of biodiversity resources for human well-being. Nevertheless, awareness of certain ecological processes such as pollination, crop variety conservation, and the use of indigenous medicinal plants remains relatively low. The study further concluded that several indigenous farming practices contribute to biodiversity loss in the study area. Cutting trees for fuelwood, hunting of wild animals, clearing forests for farming, bush burning, continuous cropping, and expansion into natural vegetation were identified as the most important drivers of biodiversity depletion. The study also established that indigenous knowledge remains an important mechanism for biodiversity conservation. Indigenous knowledge-based practices such as maintaining trees on farmland, conserving beneficial organisms, and promoting soil moisture conservation significantly support biodiversity conservation and environmental sustainability. Therefore, indigenous knowledge should be recognized as a valuable resource for sustainable natural resource management and biodiversity conservation among arable crop farmers in Southern Taraba State.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Tree conservation and integration on farmlands should be promoted through community-based forestry programmes and awareness campaigns, since the study found that trees on farmland play an important role in sustaining biodiversity and ecological balance
2. Farmer cooperative societies should be strengthened and encouraged, as they provide platforms for knowledge sharing, dissemination of indigenous conservation practices, and collaboration on biodiversity conservation initiatives.
3. Government and environmental agencies should develop policies that recognize and support indigenous knowledge systems as complementary approaches to modern biodiversity conservation strategies.

REFERENCES

1. Akinyemi, F. O. (2020). Land use dynamics and deforestation patterns in Nigeria's savanna–forest transition zone. *Environmental Monitoring and Assessment, 192*(8), 1–15.

2. Altieri, M. A. (1999). The ecological role of biodiversity in agroecosystems. Agriculture, Ecosystems and Environment, 74(1–3), 19–31. Arowolo, A. O., & Deng, X. (2018). Land use change and environmental sustainability in sub-Saharan Africa. *Land Use Policy, 77*, 520–534.

3. Chambers, R., & Conway, G. R. (1992). *Sustainable rural livelihoods: Practical concepts for the 21st century*. Institute of Development Studies Discussion Paper 296.

4. Cobb, C. W., & Douglas, P. H. (1928). A theory of production. *The American Economic Review, 18*(1), 139–165.

5. Convention on Biological Diversity (CBD). (2020). *Global biodiversity outlook 5*. Secretariat of the Convention on Biological Diversity.

6. Dasgupta, P. (2001). Human well-being and the natural environment. Oxford University Press.

7. David, J. S., Ibrahim, M., & Yakubu, A. (2023). Impacts of deforestation on livelihoods and ecosystem services in Bali Local Government Area, Taraba State. Journal of Geography and Environmental Studies, 15(2), 67–82.

8. Food and Agriculture Organization of the United Nations (FAO). (2019). *The State of the World's Biodiversity for Food and Agriculture*. Rome: FAO.

9. Garibaldi, L. A., Steffan-Dewenter, I., Winfree, R., Aizen, M. A., Bommarco, R., Cunningham, S. A., Kremen, C., Carvalheiro, L. G., Harder, L. D., Afik, O., Bartomeus, I., Benjamin, F., Boreux, V., Cariveau, D., Chacoff, N. P., Dudenhöffer, J. H., Freitas, B. M., Ghazoul, J., Greenleaf, S., … Klein, A. M. (2013).

10. GIS & Remote Sensing Group. (2024). Land use and land cover change analysis of Taraba State using satellite imagery (Unpublished technical report).

11. Howard, P. L. (2003). *Women and plants: Gender relations in biodiversity management and conservation*. Zed Books.

12. Ibrahim, A. U. (2021). Indigenous resource-use practices and environmental sustainability among rural communities in Taraba State, Nigeria. *Journal of Rural Sociology and Development, 13*(2), 56–70.

13. Ibrahim, H. Y., Yusuf, O., & Salisu, M. (2020). Marital status and participation in sustainable agricultural practices among rural farmers in Northern Nigeria. *Journal of Agricultural Economics and Extension*, 8(2), 67–75.

14. Nyong, A., Adesina, F., & Osman-Elasha, B. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. Mitigation and Adaptation Strategies for Global Change, 12(5), 787–797.