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## **Farmers' Perception and Adoption of Forest Conservation Practices in Kaiama Local Government Area of Kwara State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors LG, BO and UFY designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript.*

*Authors MBU and SBA managed the analyses of the study. Authors BOO and GLL managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The practice of shifting cultivation by farmers in Kaiama Local Government of Kwara State is been inhibited by the dedication of their farm lands used for various agricultural activities to national park, thereby resulting in the depletion of soil nutrients caused by continuous cropping on the available land. Thus, the study examines farmers' perception and adoption of forest conservation practices in Kaiama Local Government Area of Kwara State (The case of Kainji Lake National Park). Purposive random sampling was used to select three wards dedicated to the national park viz; Gwanabe 1, Kemanji and Wajibe. Primary data were gathered through the administration of questionnaires to 160 randomly selected farmers from each of the 8 communities in the three wards. Descriptive statistics, Likert-Scale and regression analysis were used to analyze the data. The result shows

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that land acquisition was mainly (66%) through inheritance. Furthermore, rotational fallow is practiced by majority (79%) of the farmers. The perception of farmers on forest conservation practices shows that scattered trees on farm land is highly adopted (4.8) and perceived as profitable (3.0) and compatible (3.0). The result of the regression analysis shows that age, education, extension contact, farming experience, cooperative membership among others significantly influenced the adoption of forest conservation practices. The acquisition of tertiary education, training of extension staff and formation of farmers' cooperative society among others were recommended.

**Keywords:** *Farmers' perception; adoption; conservation; extension.*

## 1. INTRODUCTION

Nigeria is endowed with a great variety of ecosystems and habitats and a number of unique species that are found only in Nigeria due to the wide variety in physical environment, climate and vegetation zones. However, the country has relatively high population with a corresponding high demand for agricultural land. By the end of the nineteenth century, the pressures on natural areas arising from bush fallow cultivation and other factors were becoming noticeable and protective measures were considered necessary [1]. The main purposes for which forests are cleared are agriculture, wood production, industrial layout and human settlement. The conversion of natural forest to pasture is wide spread in the tropics, where there is a long tradition of cattle husbandry. Once roads were built, the larger trees were felled and pastoralists continue the process of deforestation. Along with the trees, most of the wild animals in the forest have become endangered or extinct.

Nigeria rural population according to World Bank is 48.84% [2]. This growing rural population puts increasing demands on the natural habitats of plants and animal species, which decrease in extent and numbers as the human population increases.

Forestry is the practice and art of managing forest land and other natural resources such as trees, other plants, wildlife, soil, water, air and the climate for human benefit [1]. Forest and wildlife are renewable natural resources and their continuous existence and utilization for our own benefit will depend on their conservation and sustainable harvesting. Forest conservation is the practice of planting and maintaining forested areas for the benefit and sustainability of future generations [3].

Rural communities in Kwara State are involved in the exploitation of forest resources for economic

benefits. These forests have been significantly altered from the original state largely due to activities like harvesting of the resources, agricultural expansion and illegal exploitation of timber and non-timber products. The forests contribute significantly to the needs of the people and the economy at both the local and national level [4].

Conservation is essentially the "taking care" of our environment so that it may continue to be a fit place for living things. The popularity of the concept of conservation is the result of our overdue awareness of the serious environmental problems, which have been created by careless exploitation of natural resources and increasing population with its ancillary effects [5].

Perception is our sensory experience of the world around us and involves both the recognition of environmental stimuli and actions in response to these stimuli [6]. It is also viewed as the way of processing raw data which a person receives through his sensory organ from the environment in to meaningful patterns [7]. It was further stressed that human perception depends not only on individual personality but also on community, environment and interaction among these components. Perception entails an assessment of the poverty reduction strategies based on standards developed in the minds of the beneficiaries [8]. The spatial behaviour and behavioural responses of individuals and communities are often framed around their perceptions of problems [9].

The dependence of farmers on land and forest resources can hardly be over-emphasised and as such, the dedication of their farm lands used for various agricultural activities to national park has inhibited the use of shifting cultivation thereby resulting in the depletion of soil nutrients caused by continuous cropping on the available land. This has led to the movement of farmers outside their community in search of farm lands,

as no measure was put in place for re-allocation of their farm lands lost to park and provision of employment opportunities to them in the national park.

However, land, seascapes and natural resources that are supposed to be exploited for farming activities to meet the food demand of the increasing population are increasingly being set aside for protection in response to various drivers: to tackle biodiversity loss, to prevent deforestation as a climate change mitigation strategy and to restore declining wildlife. Within the biodiversity conservation sector, the impacts (positive and negative) of protected areas on local and indigenous communities have generated a lot of debate and discussions [10].

Despite widely voiced concerns (such as changes in attitudes and cultural practices, reduction of income due to restrictions on farmland and wild products harvesting) about some of the negative implications of protected areas for residents and neighbouring communities, and a growing interest in ensuring that they fulfill a range of social objectives as well as their more conventional conservation objectives [10], there is limited efforts in assessing the perception and adoption of forest conservation practices in the study area. This study, therefore, assessed the perception and adoption of forest conservation practices by farmers in Kaiama Local Government Area.

## 1.1 Research Hypotheses

There is no significant relationship between farmers' socio-economic and institutional factors and the adoption of forest conservation practices in the study area.

## 2. METHODOLOGY

### 2.1 The Study Area

Kaiama Local Government Area, with its headquarters in Kaiama, is found in Kwara North in the Northern guinea savanna ecology. It is bounded in the north by Borgu Local Government, New-Bussa (Niger State), in the south by Irepo Local Government, Kisi (Oyo State), in the west by Baruteen Local Government, Kosubosu (Kwara) and in the east by Moro Local Government, Kwara State. The Local Government has ten wards namely; Kaiama 1, Kaiama 11, Kaiama 111, Gwanabe 1, Gwanabe 11, Wojibe, Gwaria, Kemanji, Bani and

Adena. It has a projected population of 185,892 in 2020 based on an annual growth rate of 3.2% [11]. It lies between latitude  $10^{\circ}00'N$  and  $8^{\circ}00'$  and longitude  $2^{\circ}50'$  and  $6^{\circ}10'E$ .

The inhabitants of Kaiama are predominantly farmers, engaging in food crops production like yam, maize, sorghum, melon, groundnut, cowpea etc. The major language of the people in the area is "Boko-baru" while Yoruba, Hausa, Fulani and Baruba language also predominate in the area. The predominant religion of the inhabitants is Islam, particularly among the indigene while Christianity is freely practiced by the non indigenes and few indigenes.

Kainji Lake National Park was established in 1976 and it is situated between latitude  $9^{\circ}40'$  and  $10^{\circ}30'N$  and longitude  $3^{\circ}30'$  and  $5^{\circ}50'E$  and has a total land mass of  $5,340.82km^2$  [12]. Many indigenous people and local communities living within the region have developed a perception on the use of the natural environment in a manner that plays an important role in their livelihood strategy and the conservation of biological resources.

### 2.2 Sampling Technique

The target population for the study was the farming communities affected by the Kainji Lake National Park (KLNP) in Kaiama LGA. Purposive sampling was used to select 3 wards covered by the National Park in the Local Government due to the dedication of the land areas in these wards to National park. These wards are: Gwanabe 1, Kemanji and Wojibe wards. The sampling frame for the study comprised farmers in the 8 farming communities in these wards (i.e. Gwanabe 1= 4 farming communities, Kemanji = 3 farming communities and Wojibe = 1 farming community). These 8 farming communities were identified through reconnaissance survey and they include: Tunga-maje, Wurumakoto, Woro, Nuku, Kemanji, Babete, Tenebo and Nanu. Simple random sampling was used to select 160 farmers from each of the 8 communities in the 3 wards of Kaiama Local Government covered by Kainji Lake National Park.

### 2.3 Method of Data Collection

The data for the study were obtained from primary sources which were collected during the field survey by administering self-developed structured questionnaire to the farmers in the three wards.

## 2.4 Analytical Techniques

Descriptive statistics, Likert scale and regression analysis were used.

## 2.5 Descriptive Statistics

These include the mean, table of frequency and percentages. These were used to describe farmers mode of land acquisition, the forest conservation practices in the area and the farming system(s) adopted in the study area vis-a-vis the conservation practice.

## 2.6 Likert Scale

This is a scale measuring the degree to which people agree or disagree with a statement, usually on a 3-, 5-, or 7-point scale. A three-point Likert-type scale of highly profitable, profitable and not profitable with nominal values of 3, 2 and 1, respectively was used to obtain farmers' perception of profitability of forest conservation practices while a five-point Likert-type scale of compatible, fairly compatible, neutral, poorly compatible and not compatible with nominal values of 5, 4, 3, 2 and 1, respectively was used to obtain a quantitative measure of people's perception on compatibility of forest conservation practices.

## 2.7 Multiple Regression Analysis

Three functional forms were tried and linear form was chosen as the lead equation. This was used to determine the factors that influence adoption of Forest Conservation Practices by farmers in the study area.

The linear model specification in its implicit form is given by:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, \mu)$$

The model is explicitly specified in the form below

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + e \quad (i)$$

Where,

Y = adoption (measured by a five-point Likert scale).

X<sub>1</sub> = Farmers' age (years)

X<sub>2</sub> = Education (Number of years in formal schooling)

X<sub>3</sub> = Marital status (single = 1, married = 0)

X<sub>4</sub> = Family size (number in household)

X<sub>5</sub> = Farm size (hectares)

X<sub>6</sub> = Income (Naira)

X<sub>7</sub> = Extension contact (number of visits)

X<sub>8</sub> = Farming system (1= rotational fallow, 0= otherwise)

X<sub>9</sub> = Farming experience (years)

b<sub>1</sub> – b<sub>9</sub> = Regression coefficients

a = constant

e = error term

## 3. RESULTS AND DISCUSSION

### 3.1 Distribution of Respondents by Mode of Land Acquisition and Farming System

#### 3.1.1 Respondents' mode of Land Acquisition

Result in Table 1 reveals that the major (66%) mode of land acquisition was through inheritance. Land acquisition by purchase and rent accounts for 21 and 10% respectively. Only 3% of the farmers acquire their land through leasehold. It implies that farmers may want to hold more land so as to concede some areas to future generation apart from shifting cultivation purposes. This was confirmed by Adeola, who established that farmer's mode of land acquisition is by inheritance [13].

#### 3.1.2 Farming System Adopted by Respondents

The farming system description in Table 1 shows that rotational fallow is the major (79%) farming system adopted by the farmers. The practice of mixed farming and shifting cultivation constitutes 14% and 8% of the farming population respectively. This means that majority of the farmers will want to acquire more hectare of land to enhance shifting from an exhausted land to a more fertile land from time to time.

### 3.2 Forest Conservation Practices

Result presented in Table 2 depicts the forest conservation practices in the study area. Only 30% of the respondents practice scattered trees on farm land. This forest conservation practice is followed by homestead planting (22%), planting trees as yam stakes (20%) and orcharding (18%). However, only 5%, 4%, and 2% practice planting trees as erosion barriers, live fencing and borderline planting, respectively. This indicates that diverse forest conservation

practices are incorporated in to farming to serve a particular purpose. Adeola affirms the low involvement of farmers in live fencing, borderline planting, windbreak and use of trees as barrier against erosion [13].

### 3.3 Perception of Farmers on Forest Conservation Practices Integration to Farming

Result in Table 3 shows the perception of farmers on forest conservation practices in respect to profitability. Scattered trees on farm land is the practice that is highly profitable (3.0) with the farming practice in the study area. Other

forest conservation practice that are perceived to be profitable to the farmers are: homestead planting, planting trees as yam stakes and orcharding with the perception index score of 2.4, 2.3 and 2.2, respectively. However, farmers perceived live fencing, planting trees as barriers for erosion, borderline planting and windbreaks as not profitable. This is due to the geographical location of the area in the guinea savannah. The predominant use of scattered trees on farm land, homestead planting, planting trees as yam stakes and orcharding could be attributed to the shifting cultivation method of farming system usually practiced by the farmers in the area.

**Table 1. Distribution of farmers by land acquisition and farming system**

Variable	Frequency	Percentage
Land Acquisition		
Inheritance	105	65.6
Lease	5	3.1
Purchase	34	21.3
Rent	16	10
Farming System		
Rotational fallow	126	78.8
Mixed farming	22	13.8
Shifting cultivation	12	7.5
Total	160	100

**Table 2. Forest conservation practices**

Practice	Frequency	Percentage
Orcharding	92	17.5
Live fencing	22	4.2
Scattered trees on farm land	157	29.9
Borderline planting	8	1.5
Homestead planting	115	21.9
Planting trees as yam stakes	105	20
Planting trees as erosion barriers	26	5.0
Total	525	100

*\*Multiple choices*

**Table 3. Mean response of farmers on their perception of forest conservation practices**

Forest conservation practices	Weighted score			Total N(160)	Mean (x)
	3	2	1		
Orcharding	85	15	60	345	2.2
Live fencing	3	24	133	190	1.2
Scattered trees on farm land	155	5	-	475	3.0
Borderline planting	1	6	153	168	1.1
Homestead planting	89	50	21	388	2.4
Windbreaks	-	-	160	160	1.0
Planting trees as yam stakes	98	16	46	372	2.3
Planting trees as erosion barriers	3	32	125	198	1.2
Aggregate score				2296	1.8

### **3.4 Farmers' Perception of Compatibility of Forest Conservation Practices to Farming**

The perception of farmers with respect to compatibility of forest conservation practices to farming was examined by a five-point Likert type scale of Compatible, Fairly Compatible, Neutral, Poorly Compatible and Not Compatible with nominal values of 5,4,3,2 and 1. As Table 4 shows, there is high compatibility perception index score (4.7) for scattered trees on farm land. This implies that the system is compatible with the farming system in the study area. Homestead planting and planting trees as yam stakes are fairly compatible with the farming system in the area with perception index score of 4.4 each. However, farmers have neutral compatibility perception to orcharding as forest conservation practice (3.7). This means that farmers were flexible on the practice of orchards in the farm.

Windbreaks and planting trees as erosion barriers are perceived by farmers as poorly compatible with their farming system. This is due to the location of the study area in the guinea savannah ecology, meaning that these conservation practices are not considered as necessary by the farmers. Similarly, live fencing and borderline planting are not compatible with the farming system in the study area. This implies that these two practices are not adopted by farmers. This conforms to the finding by Babasanya, Etim and Ganiyu who submitted that if improved technology is not compatible with existing farming system, the adoption of such technology is limited [14].

### **3.5 Farmers' Level of Adoption of Forest Conservation Practices**

The level of farmers adoption of forest conservation practices as depicted in Table 5 indicated a high index score (4.8) for scattered trees on farm land, meaning that the practice is highly adopted by farmers in the study area. Similarly, the index score for homestead planting (4.1), planting trees as yam stakes (4.0) and orcharding (3.5) shows that they are well adopted by farmers.

However, farmers are uncertain about the practice of live fencing and planting trees as erosion barriers while they do not adopt borderline planting and windbreaks at all. This is not unconnected with the absence of land

conflicts and geographical location of the study area in guinea savannah vegetation belt.

The implication of this is that scattered trees on farm land will assist farmers in provision of shade where they can relax at different points while working, and as well provide storage points for farm tools. More so, the economic trees like sheabutter, parkia, baobab etc used for such purpose are additional sources of revenue to the farmers [15].

### **3.6 Factors Affecting Adoption of Forest Conservation Practices**

Multiple regression analysis was used to analyze the factors that affect the adoption of forest conservation practices by farmers in the study area. The results of the analysis as presented in Table 6 shows that age is negative but significantly related to level of adoption at 5% level of significant, implying that the older the farmer, the less his level of adoption. This is because older people are less prone to change, compared to younger ones [16]. Education is positive and significantly related to the adoption of forest conservation practices at 10% level of significant. This implies that the more educated the farmer is, the higher the level of adoption. This corroborates the finding of Ogunbameru [17] and Adesope [18]. Marital status is positive (0.006) but insignificantly related to adoption of forest conservation practices, implying that married farmers readily adopt the practice because of the benefits the entire family derive from the adoption of the practice and farm labour contribution as opined by Babasanya et al. [14]. Family size is positive but insignificantly related to adoption of forest conservation practices with 0.002 coefficient, implying that the more the family size of a farmer, the more his adoption level. The family is a significant source of farm labour for various farm activities. This is in line with the submission of Ogunwande [15]. This finding conforms with submission of Torimiro, who opines that the larger the family size, the more will be the tendency for labour availability and adoption of new practices [19].

Farm size is positive and insignificantly related to the level of adoption with coefficient of 0.002. This implies that increasing the farm size may not significantly increase the level of adoption, since the desire to acquire more land to facilitate shifting cultivation is inhibited by forest conservation policy. This agrees with Awe [20]. Similarly, extension contact is positive and

significantly related to level of adoption at 5% significant level. This means that the more the number of visits by extension workers, the higher the level of adoption of forest conservation practices. This concurs with the finding by Ekong, who opined that extension contact influence adoption of technologies [16].

Farming experience has a positive (0.003) and significant relationship with the adoption of forest conservation practices at 1% significant level in the study area. This implies that the more the years of farming experience by farmer, the higher his level of adoption. This is because farming experience affects farm managerial skills and decision making process. An experienced farmer is likely to easily identify the relative advantage of an innovation. This concurs with the submission of Babasanya et al., where it was concluded that farming experience affect adoption [14]. Also, credit facility is positive and significantly related to adoption at 1% level of significance, implying that the availability of credit facility will encourage farmers to adopt forest conservation practice in the study area. This is consistent with the submission by Ekong [16]. Similarly, Farmers membership of cooperative society is positive and significantly related to adoption at 1%

significance level, meaning that the more the involvement of farmers in cooperative, the more his level of adoption in the area. This is consistent with the apriori and submission of Babasanya et al., who concluded that cooperative society influence access to credit facilities that will influence adoption [14]. However, source of information on forest conservation practices is negative but significantly related to adoption at 1% level of significance, implying that the source of information is inversely related to farmers' adoption of forest conservation practices.

The adjusted  $R^2$  value of 56% obtained in Table 6 implied that the specified variables in the model explain the variation in the level of adoption (dependent variable) of farmers in the study area. The remaining 44% was due to other factors that were not included in the model.

Based on the findings of this study, the hypothesis that there is no significant relationship between socioeconomic and institutional factors influencing farmers' adoption of forest conservation practices in the area was rejected because socioeconomic and institutional factors influenced adoption in the study area.

**Table 4. Farmer's perception of compatibility of forest conservation practices**

Forest Conservation Practices	Weighted score					Total N(160)	Mean (X)
	5	4	3	2	1		
Orcharding	56	41	31	17	15	586	3.7
Live fencing	-	-	49	51	60	309	1.9
Scattered trees on farm land	109	51	-	-	-	749	4.7
Borderline planting	-	-	54	39	67	307	1.9
Homestead planting	71	89	-	-	-	711	4.4
Windbreaks	-	-	73	48	39	354	2.2
Planting trees as yam stakes	69	78	13	-	-	696	4.4
Planting trees as erosion barriers	-	-	85	29	46	359	2.2
Aggregate score	-	-	-	-	-	4071	3.2

**Table 5. Farmers level of adoption of forest conservation practices**

Adoption of FCP	5	4	3	2	1	Total N(160)	Mean (X)
Orcharding	75	14	25	7	39	559	3.5
Live fencing	13	13	26	10	98	313	2.0
Scattered trees on farm land	125	33	1	1	-	762	4.8
Borderline planting	1	8	35	16	100	274	1.7
Homestead planting	77	48	12	12	11	648	4.1
Windbreaks	3	-	38	3	116	251	1.6
Trees as yam stakes	85	27	20	14	14	635	4.0
Trees as erosion barriers	-	17	47	8	88	313	2.0
Aggregate_score						3755	3.0



**Table 6. Multiple regression results of factors influencing adoption of Forest Conservation Practices**

Variables	Coefficients	Standard Error	t-value
Constant	0.539	0.097	5.559***
Age	-0.006	0.003	-2.337**
Education	0.034	0.017	1.970*
Marital status	0.006	0.037	0.164
Family size	0.002	0.006	0.433
Farm size	0.002	0.007	0.256
Income	0.346	0.439	0.787
Extension contact	0.006	0.003	2.192**
Farming system	0.007	0.026	0.262
Farming experience	0.003	0.001	3.778***
Credit facility	0.062	0.024	2.528***
Membership of cooperative	230.36	90.858	2.535***
Information source	-0.038	0.013	-2.832***

Adjusted R-square = 0.563 \*\*\* = Significant at 1% \*\* = Significant at 5% \* = Significant at 10%

#### 4. CONCLUSION AND RECOMMENDATIONS

Arising from the findings of the study it was concluded that mode of land acquisition was by inheritance, forest conservation practices was perceived as highly compatible with farmers existing farming system. Similarly, both socio-economic and institutional factors influenced adoption of forest conservation practices in the study area.

Based on the conclusions of the study, the following were recommended:

1. Since education significantly affect adoption, attainment of tertiary education among farmers is thus, recommended.
2. The study identified extension contact as important factor of adoption, training of extension agents on forest management practices by the relevant agencies at both local and state government level will assist in addressing the effects of tree canopies.
3. Since credit facility is a significant factor of adoption, the formation of cooperative society by farmers will help in the sourcing of farm inputs and credit facilities to facilitate forest conservation practices.
4. Since information source significantly influenced adoption, the use of social media for dissemination of information is therefore, recommended.

#### CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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