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SUSTAINABLE UTILISATION OF AGROFORESTRY RELATED LAND USE PRACTICES AMONG FARMERS IN AKINYELE LOCAL GOVERNMENT AREA, OYO STATE

Oke Olalekan Oluwole, Adebayo Samson ADEOYE, Adeboyin Funmi Aderounmu, Aderinto, A.

Federal College of Forestry, Ibadan
Forestry Research Institute of Nigeria
P.M.B 5087, Jericho Hills, Ibadan, Nigeria

ABSTRACT

The study assessed the sustainable utilisation of agroforestry related land use practices among farmers in Akinyele Local Government Area, Oyo State. A multistage technique was used to select 50 respondents from the study area. A well-structured questionnaire and interview session was used to collect information from the respondents. Frequency distribution and percentages were used to explain the objectives while Chi-square and Pearson Product Moment Correlation used to test hypotheses. The findings showed that most respondents (76.0%) were male, 60.0% were in the age bracket of 41-50 years, married (46%) and farming occupation (96.0%). The benefits most of the respondents derived from the agroforestry related practices include the availability of more source of revenue (96.0%), increased crop yield (90.0%). The utilisation of agroforestry practices enhances income (98.0%), provision of shade for livestock (94.0%) and medicinal herbs (92.0%). The socio-economic characteristics, age (X^2= 10.108, p>0.342) had no significant relationship with sustainable utilisation of agroforestry related land use practices. Benefits derived had significant correlation with sustainable utilisation of agroforestry related practices (r= 0.320, p< 0.023). In conclusion,

there should be formation of cooperative groups and provision of adequate information from extension agents to improve the level of participation of farmers in agroforestry.

Keywords: *Land Use, Other Related Agroforestry Practices, Benefits, Utility Typology*.

Corresponding author: Adebayo Samson ADEOYE can be contacted at samalaba77@gmail.com

1. INTRODUCTION

Agroforestry defines the aggregation of all land use practices and innovative techniques whereby permanent plants like trees, shrubs, palms and bamboos are deliberately integrated on the same unit of land for multiplication of agricultural crops and/or animal production. It serves as an important tool to increasingly address soil fertility issues in Africa (Glover et al, 2012). According to Barrios *et al*. (2012) when trees are incorporated in crop fields, it often reduces soil erosion, improve water and nutrient cycling as well as increasing both soil organic carbon, activity of soil organisms causing difference in the vegetation cover of the earth. However, agroforestry plays a significant role as an eco-friendly as well as modern farming sustainability in land use practice in the overall farm productivity interest in which combination of food crops, woody perennial trees and livestock on the same land in alternate form or at the same time using scientific management practices will improve the condition of the people economically.

These factors which are overall farm productivity, enrichment of soil through litter fall, maintenance of environment services in terms of climate mitigation, phytoremediation, and

protection of watershed and conservation of biodiversity perform vital roles in agroforestry practices. The natural forest policy of thirty-three (33%) forest cover can be achieve through the effective and alternate management of agroforestry practices. Development of sustainable rural production system is possible through various practical knowledge and skills that are derivable from practicing agroforestry.

Benefits accrued to farmers from practice of agroforestry include the positive effect on their livelihood by increasing crop yield as well as increased food security (Akinnifesi et al; 2010; Garrity et al; 2010). Also, according to Luedling *et al*. (2011) agroforestry creates improvement in farmers' ability to deal with the effects of climate change and efficient use of rain that caused by yield stability under rainfed agriculture. Jose (2009) and Nair *et al*. (2009) corroborated that various ecosystem services are provided through agroforestry as benefit to the environment. Adoption of agroforestry practices by farmers might have been a response to ensure sources of sustaining their families. The economic benefit of most of the woody perennial take very long to be realized and this is deterrent to the agroforestry. The objectives of the work were to assess:

A. Socio-economic characteristics of farmers in the study area;

B. Agroforestry related land use practices;

C. Land use benefits derived from agroforestry practices;

D. Other utility typologies of agroforestry practices;

E. Extant factors in agroforestry practices; and

F. Constraints experienced by farmers in agroforestry practices.

2. REVIEW OF LITERATURE

Agroforestry systems are often management of trees and shrubs and utilization of their products. The trees and shrubs create impact on other components in the land use system. Therefore, agroforestry systems are normally characterised by ecological and economic interactions between woody perennials and crops as well as livestock (ICRAF, 1992; Agboola, 1980). Agroforestry has proved to be a very useful means of tackling the challenges of global food production on a sustainable basis to ensure a food secure population (ICRAF, 2000). Agroforestry shares principles with intercropping, both place two or more plant species (such as nitrogen-fixing plants) in proximity and both provide multiple outputs. Therefore, overall yields are higher and single application or input is shared, cost are reduced (Wojtkowski, 2002). Agro-forestry might simply be “tree on farm” hence agro-forestry farm forest and family forest can be broadly understood as the commitment farmers, alone or in a partnership, towards the establishment of forest on their land (Oram, 1993). It enhances sustainable utilization by improving the supply of food and being environmentally friendly (FAO, 1987; Spore, 1995). It has been described as a very old system which has been practiced by farmers, particularly those characterized by low level of technology and resource inputs and mostly in areas believed to be unsuitable for profitable monocropping systems (Sekhwela, 1990).

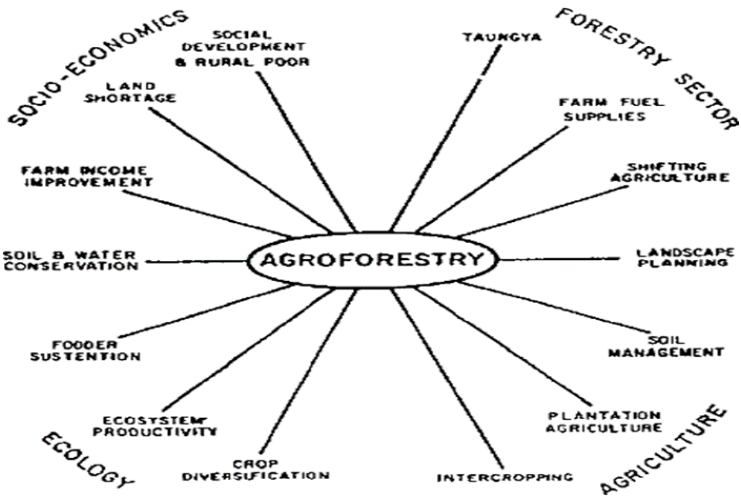

Figure 1. Conceptual Framework of Agroforestry Land Use Practices

3. RESEARCH METHODOLOGY

3.1 Study Area, Sampling Procedure and Sample Size

Investigation into this study was conducted in Akinyele Municipality, Nigeria. The Municipality was established in 1976 in a land area of 464.892 Km^2 on the geographical coordinates of 7 ˚31′ 42′′ North and 3 ˚54′ 43′′ East. The Municipality is headquartered at Moniya with twelve (12) wards. The wider land area of the Local Government is covered by rain forest broadly dominated by palm trees and plantain. The vegetation in the local government is classified as crop lands, secondary forest, natural forest, bare land, and built up areas. The type of crops cultivated includes maize, cassava, yam, and vegetables among others.

Akinyele Local Government Area of Oyo state was selected as the study area for this scientific research. The choice of the study area was due to introduction of agroforestry to some wards in the area. Multi-stage sampling technique was employed in selecting five wards, while random sampling was used to select five wards which in turn leads to selection of 10 farmers from each of the wards making a total of 50 farmers that were selected for the study. Questionnaire and interview were employed to elicit information from the selected respondents. Analysis of data collected was done using frequency, percentages for the objectives while Chi-square and PPMC were used to test hypotheses.

This study was conducted in accordance with the ethics committee approval of the Federal College of Forestry, Ibadan with reference code: *FCF2022AEM*.

3.2 Analytical Tools

The analytical tools used for the study were Chi-square and Pearson product moment correlation.

i. Chi-square

$$\chi^2 = \Sigma\left[\frac{(f_o - f_e)^2}{f_e}\right] \quad \text{..... (i)}$$

Where:

χ^2 = Chi-Square.

Σ = Sum total.

f_O = frequencies of observed nominal variables such as sex, religion, marital status; that is the socio-economic variables and other qualitative variables for the study.

f_e = expected frequencies of occurrence determined from response categories.

ii. Pearson product moment correlation

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{(n\sum X)^2 - (\sum X^2)(n\sum Y^2) - (n\sum Y)^2}} \quad \text{..... (ii)}$$

Where:

r = correlation coefficient.

n = sample size.

Σ = summation sign.

X = independent variables for the study.

Y = dependent variable for the study, that is; sustainable utilisation.

4. RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Farmers

In Table 1 (See Appendix) majority of the farmers (76.0%) were male while 24.0% were female. Alfred (2001) and Adedotun (2010) in their work corroborated this finding that in most communities in Nigeria male headed households usually had dominance over female headed household. Age category of the respondents falls within the age range of 41-50 years (60.0%). This is an indication that most of the farmers are in their active

ages which enable them to participate in agroforestry. The result is in line with Atibioke *et al*. (2012) who noted that most people living in rural areas are married. About 44.0% of the respondents had secondary education while primary education had thirty-two (32.0%) obtained by respondents and twelve percent (12.0%) had tertiary education. The level of education of farmers will directly affect their ability to adapt to change and to accept a new idea, in which case farmers who possess some levels of education are most likely to accept or use new technologies than the ones who do not according to Adekunle (2009). Ninety six percent (96.00%) of the respondents were into farming, which translate that farming is their major occupation. Household size varied; 10% had 1-3 members, 74.0% had 4-6 while 16.0% had 7-9 members. This suggests that more adult members in a household form more family labour force that would perform farming activities and as well as practice of agroforestry.

Table 2 showed that 94.0% of respondents had trees on their farmland. This implies that agroforestry practice would cause an effect in increasing the infiltration and water holding capacity of the topsoil as well as the ability of the soils to capture and use farm runoff as reported by (Kalaba *et al*., 2009). Eighty six percent (86.00%) practiced shifting cultivation, 86.00% of the respondents also engaged in fuel-wood production. This means that most rural dwellers make use of fuel-wood for cooking. This is in line with FAO (2001) which states that rural dwellers make use of fuel-wood as their major source of energy in a natural-based environment. Twenty-one respondents (42.0%) used trees as a windbreak. Windbreak practice helps in

controlling the wind. Six percent (6.0%) of the respondents practice alley cropping.

Table 2. Distribution of Respondents Based on Agroforestry Related Land Use Practices (n =50)

Land Use	Practiced	Not Practiced
Taungya	0(0.00)	50(100.0)
Trees on farmland	47(94.0)	3(6.0)
Shifting cultivation	43(86.0)	7(14.0)
Fuel wood production	43(86.0)	7(14.0)
Windbreak	21(42.0)	29(58.0)
Alley cropping	3(6.0)	47(94.0)
Improved Fallow practice	2(4.0)	48(96.0)

Source: Field Survey, 2022.

In Table 3, majority (96.0%) of farmers are of the opinion that agroforestry is of help in deriving more revenue, which brought improvement to socio-economic conditions of farmers. Ninety two percent (92.0%) respondents participated in agroforestry which afford them the benefit of enjoying increased crop yield and variety of crops. Also, 94.0% opined that it serves as sources of raw material such as building materials, medicine, income from fuel-wood, 90.0% of the respondents believe that some other harvested crop serves as a source of food, 74.0% of the respondents use trees as fences on their farmland and to construct farmsteads, houses for goats and sheep. 84.0% of the respondents said it helps in maintaining soil organic matter by

providing shade for farmland. The result is in tandem with Nair *et al*., (2007) that agroforestry and its related practices has a great potential to improve soils as compared to arable cropland due to increased rates of organic matter addition and retention, 32.0% of respondents agreed that agroforestry helps in biodiversity, 82.0% agreed that agroforestry and its land use related practices help to improve soil fertility and conservation of soil nutrients with the help of nitrogen-fixing trees and shrubs. Also 66.0% of the respondents used agroforestry related practices to fallow their land, 80.0% of them noted that some of the leaves serve as fodder for their animals while, 82.0% reported that trees on land were adding to their income level. In addition, 60.0% of the respondents accept that agroforestry improves and upgrades the environment. Forest products are used as material for building, as 44.0% of the respondents said that they use the forest product as materials for the building of their houses, farmsteads, pens and which by way of reducing the cost of building incurred by the farmers. Trees on land serves a medicinal purpose, and 72.0% of the respondents affirmed that some of the extraction of the tree back and leaves serves as a medicinal purpose for the treatment of various ailments.

Table 3. Distribution of Respondents Based on Land Use Benefits Derived from Agroforestry Related Practices (n=50).

Land Use Benefits	Yes	No
Availability of more source of revenue	48(96.0)	2(4.0)
Increased crop yield	46(92.0)	4(8.0)
Source of raw materials	47(94.0)	3(6.0)

Source of food	45(90.0)	5(10.0)
Source of fence materials	37(74.0)	13(26.0)
Maintaining soil organic matter	42(84.0)	8(16.0)
Biodiversity	16(32.0)	34(68.0)
Improved soil fertility	41(82.0)	9(18.0)
Use of fallow for crop land	16(32.0)	33(66.0)
Fodders for animals	40(80.0)	10(20.0)
Increased in income	41(82.0)	9(18.0)
Enhancement of environment	30(60.0)	20(40.0)
Forest materials for building	22(44.0)	28(56.0)
Source of medicinal plant	36(72.0)	14(28.0)

Source: Field Survey, 2022.

Table 4 shows that most farmers (72.0%) used trees as windbreakers to bring down the effect of wind which on soils, crops, livestock, wildlife, and people. It also prevents the wind from damaging the structure and crops on the farm. Furthermore, 92.0% of the respondents used tree backs, leaves, and other parts of the tree because they provide traditional means for the treatment of many internal diseases considered difficult to cure. In addition, 98.0% of respondents are of the opinion that agroforestry was utilized as an additional income when trees or its products are harvested. Branches and leaves of some trees can be pruned from the trees and fed directly to livestock. Also 94.0% of the respondents noted that agroforestry serves as fuel and timber. Similarly, 90.0% of respondents used agroforestry for weed reduction that is

shading by tree and moderation of microclimate could be an important factor in suppressing weeds, 80.0% of them used agroforestry for human nutrition, 94.0% of the respondents harvested as a source of food. 92.0% of the respondents used trees to control erosion, while 80.0% used trees as boundaries for protecting their farmland.

Table 4. Distribution of Respondents Based on Other Utility Typology of Agroforestry Practices among Farmers (n = 50)

Other Utility Typology	Utilised	Not Utilised
Windbreak	36(72.0)	14(28.0)
Medicinal herbs	46(92.0)	4(8.0)
Additional income	49(98.0)	1(2.0)
Shade for livestock	47(94.0)	3(6.0)
Timber stake	47(94.0)	3(6.0)
Reduce weeding	45(90.0)	5(10.0)
Human nutrition	40(80.0)	10(20.0)
Soil fertility enrichment	44(88.0)	6(12.0)
Food(fruits)	44(88.0)	6(12.0)
Soil erosion control	47(94.0)	3(6.0)
Boundary protection	46(92.0)	4(8.0)
Fodders	38(76.0)	12(24.0)

Source: Field Survey, 2022.

Table 5 shows that 66.0% of farmers stated that age serves as a factor that determines the practice of agroforestry among farmers because young people are more involved due to their ability to acquire and use information on new technology faster than old people (Sonii, 1992). Also, 70.0% of respondents agreed that land ownership affects the feasibility of agroforestry designs and the motivation for adopting agroforestry system or its land use related practices, 76.0% of the respondents affirmed that size of household determines the practice of agroforestry, while 78.0% noted that level of education acquired will also determines the practice of agroforestry. Similarly, 78.0% of respondents are of the opinion that environmental factors such as climate soil, drainage, sunlight, and precipitation will be key to determine the trees, crops, and livestock that can be grown or raised in each area, while 84.0% professed that the level of awareness will determine the level of related agroforestry practices.

Table 5. Extant Factors in Agroforestry and Its Related Land Use Practices among Farmers

Extant Factors	**Yes**	**No**
Age of respondents	33(66.0)	17(34.0
Land ownership	35(70.0)	15(30.0)
Household size	38(76.0)	12(24.0)
Level of education	39(78.0)	11(22.0)
Environmental factors	39(78.0)	11(22.0)
Household income level	40(80.0)	10(20.0)

Level of awareness	42(84.0)	8(16.0)
Gender of the farmer	31(62.0)	19(38.0)
Year of experience	33(66.0)	17(34.0)
Origin of the farmers	19(38.0)	31(62.0)
Distance of the village to nearest town	26(52.0)	24(48.0)

Source: Field Survey, 2022.

Table 6 (See Appendix) shows the constraints faced by farmers in the study area. It revealed that majority (80.0%) of respondents reported inadequate funds/capital was a major problem faced due to difficulties in buying or renting machines, while 62.0% of them opined that land tenure was a problem because most of them are not the rightful owners of the land and they could not cultivate whatever crop they desire, 74.0% reported poor yield as a major problem, while 78.0% of the respondents said poor soil fertility was a problem. Also, 70.0% of the respondents noted that high incidence of pests and diseases was a major problem, while 66.0% of them non availability of seed and seedlings as a major problem. In addition 58.0% said that climate change was a major problem and it has affected a lot that most of their crops do die off because of change, 54.0% agreed to the fact that they do not have interest but they always like to extend their farm and practice agroforestry more fully if they can get assistance from the government ,58.0% said that their crops are not covered by trees but rather it is protecting their crop from the weather condition, 56.0% of the respondents said insufficiency of plant species is a major problem they face. These findings agreed with

the work of both Sangeetha *et al.* (2015) *and* Karshie, *et al.* (2017) where they found that lack of agroforestry seedlings serves as the most critical constraints faced by farmers in adopting agroforestry species.

Table 7 reveals that the socio-economic characteristics age had no significant relationship with the level of utilization of related agroforestry practices. This implies that socio-economic characteristics do not affect utilisation of agroforestry.

Table 7. Result of Chi-square analysis of relationship between respondents and use of agroforestry related practices

Variables	**Chi-square value**	**p-value**	**Decision**
Gender	4.557	0.207	Not significant
Age	10.108	0.342	Not significant
Marital Status	1.087	0.780	Not significant
Religion	0.882	0.830	Not significant
Education	5.289	0.507	Not significant
Occupation	2.112	0.549	Not significant
Years of farming	36.269	0.820	Not significant
Household size	10.016	0.124	Not significant

Source: Field survey, 2022.

Result of table 8 of Pearson Product Moment Correlation analysis shows a significant relationship between the benefits derived from agroforestry or related land use practices and

respondents' utilization of agroforestry produce/value (r = 0.320, p <0.023).

Table 8. Pearson Product Moment Correlation (PPMC) result of relationship between benefits derived by respondents and their sustainable utilisation of agroforestry related produce/value

Variables	r-value	r-value	Decision
Benefits Derived and Sustainable Utilisation	0.320	0.023	Significant

The result in Table 9 shows that there is no significant relationship between the constraints faced and sustainable utilisation of agroforestry produce/values (r = 0.200, p > 0.05).

Table 9. Pearson Product Moment Correlation (PPMC) analysis of relationship between constraints faced by respondents and sustainable utilisation

Variables	r-value	p-value	Decision
Constraint faced and Sustainable Utilisation	0.200	0.163	Not Significant

5. CONCLUSION AND RECOMMENDATION

Married men were in their active age and practiced agroforestry related land use. Farmers engaged in various land use system related to agroforestry practices in the area of study and many of the farmers acquired secondary education, although some still diversified into other occupations outside farming as an occupation. The majority of farmers opined that agroforestry is

of immense help in deriving more revenue, which brought improvement to socio-economic conditions of farmers, participated in agroforestry which afford them the benefit of enjoying increased crop yield and variety of crops. Also, they opined that it serves as sources of raw material such as building materials, medicine, and income from fuel-wood.

There should be adequate provision of information through extension agents to farmers as regards the benefits of agroforestry practices in order to increase their level of participation. Government should provide assistance to farmers through the provision of soft loans as a form of incentive and other related technical assistance to enable them actively participate in agroforestry practices. The issue regarding the poor yield from practicing agroforestry should also be looked into with the provisioning of either organic or inorganic fertilizer.

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APPENDIX

Table 1. Distribution of Farmers Based on Socio-economic Characteristics (n= 50).

Socio-economic Variables	Frequencies	Percentages
Gender		
Male	38	76.0
Female	12	24.0
Age (years)		
20-30	1	2.0
31-40	9	18.0
41-50	30	60.0
Above 50	10	20.0
Marital Status		
Single	0	0.00
Married	46	92.0
Divorced	0	0.00
Widow	4	8.0
Religion		
Christianity	31	62.0
Islam	19	32.0
Traditiomal	0	0.00
Others	0	0.00
Educational level		
No forrmal education	0	0.00
Adult education	0	0.00
Primary education	16	32.0
Secondary education	22	44.0
Tertiary education	12	24.0
Occupation		
Farming	48	96.0
Lumbering	0	0.00
Fishing	0	0.00
Hunting	0	0.00
Civil servant	2	4.0
Others	0	0.00
Ethnicity		

Yoruba	48	96.0
Hausa	0	0.00
Igbo	2	4.0
Others	0	0.00
Farming experience		
5 years below	8	16.0
6-10 years	12	24.0
11-15 years	13	26.0
16-20 years	8	16.0
Above 20	9	18.0
Household size		
< 3	5	10.0
4-6	37	74.0
7-9	8	16.0

Source: Field Survey, 2022.

Table 6. Constraints Experienced by Farmers Practicing Agroforestry

Constraints	Major	Minor	None
Inadequate capital	40(80.0)	10(20.0)	0(0.00)
Land tenure system	31(62.0)	18(36.0)	1(2.0)
Poor yield	37(74.0)	11(22.0)	2(4.0)
Poor soil fertility	39(78.0)	10(20.0)	1(2.0)
High incidence of pest and disease	35(10.0)	14(28.0)	1(2.0)
Non-availability of seed and seedling	33(66.0)	17(34.0)	0(0.0)
Climate	29(58.0)	19(38.0)	2(4.0)
Lack of interest by farmers	27(54.0)	21(42.0)	2(4.0)
Shedding of crops by trees	29(58.0)	19(38.0)	2(4.0)
Limited use of machinery	25(50.0)	24(48.0)	1(2.0)

Lack of chemical	31(62.0)	18(36.0)	0(0.0)
Insufficient plant species	28(56.0)	22(44.0)	0(0.0)
Livestock grazing	6(52.0)	23(46.0)	1(2.0)
High cost of labour	25(50.0)	23(46.0)	2(4.0)
Lack of workers	20(40.0)	27(54.0)	3(6.0)
Fire outbreak	12(24.0)	28(56.0)	1(20.0)
Poor extension Service	2(4.0)	21(42.0)	27(54.0)
Lack of incentives	1(2.0)	21(42.0)	28(56.0)

Source: Field survey, 2022.