

# Determinants of Adoption of Agroforestry Practices Among Farmers in Southwest Nigeria

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## ABSTRACT

*The study examined the determinant factors affecting agroforestry practices in South West Nigeria. The paper examined the ownership and management of agroforestry practices, utilization and sustainability of the practices, as well as the challenges being faced by farmers practicing agroforestry in the study area. Multi-stage sampling technique was used to select 200 respondents. Most of the respondents (82%) are married, mean age of agroforestry farmers was 52 years. About 81.5% of the respondents had formal education while 92% are involved in farming as their primary occupation. From the study, 39.5% of the respondents are involved in the practice of shelterbelt and improved fallow (35%), Taungya (24%), alley cropping (16%), tree on range land (10%), and Apiculture (2.5%). The study revealed that there was positive and significant relationship between adoption and, age, income, years of experience and household size of the respondents.*

**Key words:** Agroforestry practices, determinant, adoption, farmer, Nigeria

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## INTRODUCTION

Over the years, sustainable management of the tropical forest resources has been of primary concern due to its potential impact on biodiversity and importance in maintaining global ecological functions. In spite of its importance, the natural tropical high forest has continued to diminish rapidly in the African continent, thus jeopardizing the realization of sustainable forest management (Udofia, 2005). The close of this century may witness widespread disaster arising from misuse and over exploitation of forest resources in the African continent if appropriate measures are not adopted.

It was assumed at the onset of 19<sup>th</sup> century that, humans had little or no impact on the environment. A rich and varied vegetation, dominated by trees and heterogeneous fauna developed and maintained itself within complex ecosystems (FAO, 2004). The diversity of the African tropical rainforests and the rich genetic pool they contain, provided resources of vast potential that the metropolitan powers recognized and exploited with little or no regard for conservation. Most of the timber rich zones of Africa are faced with diminishing forest resources due to forest degradation, human and animal population increase, mismanagement of the forest and other forms of forest exploitation. Adedire (2007) predicted that within the next thirty years, unless adequate measures are taken, most humid tropical forestland areas in Africa would be

transformed into unproductive land while the deterioration of the savannah into desert will be accelerated.

The climate is one of the main vegetation forming factors, causing difference in the vegetation cover of the earth. This relationship suggests that a feedback mechanism exists and that changes in vegetation, including those induced by human may result in irreversible changes in climate. Vegetation cover, socio-economic growth and development are positively correlated in nature with agriculture and forestry (FAO, 2004). It therefore behooves the developing countries to embrace sustainable agroforestry geared towards meeting the demand for goods and services for the ever-teeming human population.

In Nigeria, biodiversity is lost as a result of population pressure, habitat destruction, over exploitation, change in land use, pollution and lack of emphasis on conservation. As the natural forests were harvested, particularly for timber, the need for establishment plantation forest was realized and large scale plantations of timber and pulpwood species were established in various parts of the country to feed the expanding wood processing industry. According to Onumadu (2000), these plantations initially showed an increasing trend up to the 1980s after which the trend started declining. Agroforestry practices also play a critical role in global climate regulation as forest trees absorb

carbon dioxide, a greenhouse gas believed to be responsible for global warming. Plants naturally absorb carbon dioxide and give out oxygen in the process of photosynthesis. Tropical rainforests absorb more carbon dioxide than any other terrestrial ecosystem on earth. There is general agreement among the scientific community that by absorbing some of the gas, rainforests play a vital role in lessening its impacts. Efforts have been made over the years to ensure that improved agroforestry practices are adopted by farmers, to reduce some of the environmental and economic problems or challenges facing them. However, various issues have been raised on adoption of the agroforestry practices by the farmers.

In view of the above, this study was carried out to identify determinants of adoption of agroforestry practices among farmers in South west Nigeria. Specifically, the following objectives were addressed: socio-economic characteristics of the farmers, identify the agroforestry practices undertaken by the farmers, examine the factors affecting utilization of sustainable agroforestry practices and to identify the major constraints faced by the farmers in practicing sustainability of agroforestry. This hypothesis, stated in a null form, was tested:

H<sub>01</sub>: There is no significant relationship between the socio-economic characteristics of the respondents and adoption of agroforestry practices.

## METHODOLOGY

The study was conducted in South west zone, Nigeria, consisting of farmers practicing agroforestry in Ondo and Osun States, Nigeria. Ondo state lies between 5° 45' and 8° 15' North of the equator and longitude 4° 30' and 6° 00' East of the Greenwich Meridian. The farmers in the State grow food and other crops for domestic consumption and export, these include Cocoa, Cashew, Cassava, Rice, Palm produce, Coffee, Yam, Timber, Citrus, Plantain, Soyabeans, Cowpea and Kolanut. Osun state is located also in the South West part of the country and lies within latitude 7° and 9° North of Equator and longitude 2.75° and 6.75° East of Greenwich Meridian, it falls within the tropical humid climate that is characterized by wet and dry seasons. The people of the state are mostly traders, artisans and farmers. The farmers produce food crops such as yam, maize, cassava, cocoyam and beans, also produced are cash crops such as cocoa, tobacco and palm produce. The population for this study consists of farmers practicing agroforestry and emphasis was therefore on the practice that constitutes agroforestry, within this area.

### Sampling procedure and sample size

The study was carried out in 2012. Multistage sampling was used for the study. Ondo and Osun states were randomly selected among the states in South Western Nigeria. Three

local government areas where agroforestry practices were prominent were purposively selected from each state. Ife Central, Oriade and Ila Local government areas were selected from Osun State while Akure North, Ose and Owo local government areas were chosen from Ondo State. Two communities from each local government area were randomly selected. Each community was divided into three wards out of which one was randomly selected. From each ward eighteen farmers were randomly selected and interviewed, resulting to a total of 36 respondents from each local government area and a total of 216 for the two states. However, only 200 questionnaires were retrieved for the analysis. Focus group discussion and observation technique were also used to obtain information from the farmers.

### Methods of data analysis

Descriptive and inferential statistics were used to analyze the data. This includes the use of frequency and percentage, chi square and regression analysis. Likert scale was also used to measure the perception of respondents concerning agroforestry practices.

## RESULTS AND DISCUSSION

Most of the farmers were middle aged (mean age of 52 years), with farmers' ranging between 26 and 86 years. This implies that most of the respondents were in their active years and as such could participate effectively in agroforestry activities. Sixty-eight percent of the respondents were male, while 32% were female. This implies that there is dominance of male gender in farming activities, who adopted agroforestry practices. Alfred (2001) and Adedotun (2010) stated that male headed households usually out-number female headed household in most communities in Nigeria. Majority of the respondents (82%) were married, only 3% were single; 13% were widowed, while 2% were divorced. A large proportion (81.5%) of the respondents had both formal and non-formal education while 18.5 did not have any form of education. This result supports the earlier findings of Okunlola *et al.* (1994) and Iwala (2004) that education is related not only to the ability to obtain and process information, but also to the use of more sophisticated techniques by the farmers. Forty-nine percent of the farmers were household heads. Majority of farmers (83%) were Christians, while 17% were Moslems. Majority of the respondents (51%) have been in farming business for more than 15 years.

### Agricultural activities in the study area

The mean farm size of the respondents was 2.7 hectares. About 55% of the respondents have their farms plots located in the same place while the remaining 45% have their farms in scattered locations, either because of the type of agro-forestry practices adopted or as risk aversion

strategy. High proportion (83%) of the farms are between 1 and 2.5km far from respondents' homes, 15% were between 2.6 and 5km away while 2% were between 5.1 and 7.5km from the farmers' homes. Major farm operations such as land clearing, ridging, planting, weeding and harvesting were the common practices for which labour was used in the study area. Two types of labour were identified and utilized by respondents, they were family and hired.

#### **Access to information by the Respondents**

Half of the respondents (50%) obtained information through non-governmental organizations, such as the Rural Development Programme (RUDEP). Twenty-three percent of the respondents obtained information through extension agents, 19.5% from relatives and friends while 7.5% obtained information from mass media. The implication of this is that the Non-Governmental Organisations were more involved in information dissemination concerning agroforestry practices. The study also revealed that the mass media were not much utilized for information dissemination on agroforestry practices, thus limiting access to information to individual and group contact methods. This not in consonance with extension principle that recommends the combination of extension methods as the best, for information dissemination to create awareness for adoption of techniques (Okunlola, 2008).

#### **Awareness of Agroforestry Practices**

The agroforestry practices encountered in this study were: improved fallow, taungya, alley cropping, multipurpose tree on cropland, home garden, shelter belts and, live hedges, trees on range land, Protein banks, Home garden involving animals, multipurpose woody hedge rows, apiculture with trees and aqua forestry. From the study, 72.5% of respondents were aware of improved fallow practice, 57.5% multipurpose tree on crop land, 54.5% establishment of woodlot for fuelwood production, and 54% were aware of the use of shelterbelts and windbreak line hedges. The reason for the result could be because the use of improved fallow practice is one of the indigenous techniques for improving soil fertility by farmers while the NGO's and extension agents worked extensively on introducing the use of multipurpose tree on cropland and establishment of woodlot for fuelwood production which are of immense economic benefit to the farmers. The farmers asserted that they were not aware of Aqua forestry (63%) and multipurpose woodlots (51.5%) among others. Protein bank and Aquaforestry were alien to the farmers and their locations do not also support Aqua forestry. The pattern of adoption for their practices were found to have varied from one practice to the other, despite the fact that respondents were aware of them all, not all were adopted. Table 2 revealed that farmers mostly adopted the use of shelterbelts and windbreak (39.5%) followed by improved

fallow system (35%), Taungya system (24%) and Alley cropping (16.5%) as agroforestry practice.

#### **Respondents' perception of factors affecting adoption of agroforestry practices**

In Table 3, forty-eight percent of the respondents strongly agreed that agroforestry practice is very complex to understand while 12.5% strongly disagreed. This implies that most of the respondents agreed that it is a complex practice its understanding and utilization can be enhanced through further training and education of the farmers. Fifty-nine percent of the respondents also strongly agreed that agroforestry is not a costly practice to adopt while 37% strongly agreed that agroforestry has increased their land area for cultivation. About 34.5% of the respondents strongly agreed that their land ownership pattern affects pattern of agroforestry adoption, which agrees with the results of Oke (2002) that sustainability of fallow system is being affected by shortage of land and increasing population pressure. Fifty-nine percent strongly agreed that agroforestry practices conform with the land system practice of their areas, while 7.5% agreed, 9.50% disagreed and 24% strongly disagree, which further confirms the assertion that "land ownership pattern affects pattern of agroforestry practice adopted. Lack of access to credit is another major factor affecting adoption of agroforestry by the respondents, as 52% strongly agreed to this assertion, 9% agreed, 22% strongly disagreed while on 17% disagreed. About half of the respondents (51%) strongly agreed that there is inadequate source of information needed for the adoption of the practices. The implication of this is that information needed for effective and sustainable agroforestry practices were not available to the forty-eight percent of the respondents strongly agreed that agroforestry practice is very complex to understand while 12.5% strongly disagreed. This implies that most of the respondents agreed that it is a complex practice its understanding and utilization can be enhanced through further training and education of the farmers. Fifty-nine percent of the respondents also strongly agreed that agroforestry is not a costly practice to adopt while 37% strongly agreed that agroforestry has increased their land area for cultivation. About 34.5% of the respondents strongly agreed that their land ownership pattern affects pattern of agroforestry adoption, which agrees with the results of Oke (2002) that sustainability of fallow system is being affected by shortage of land and increasing population pressure. Fifty-nine percent strongly agreed that agroforestry practices conform with the land system practice of their areas, while 7.5% agreed, 9.50% disagreed and 24% strongly disagree, which further confirms the assertion that "land ownership pattern affects pattern of agroforestry practice adopted. Lack of access to credit is another major factor affecting adoption of agroforestry by the respondents, as 52% strongly agreed to this assertion,

**Table 1:** Level of awareness of Agroforestry Practices in the study area

Agroforestry Practices	Very aware	Aware	Not Aware
	Freq. (%)	Freq. (%)	Freq. (%)
a) Improved fallow practice	145 (72.5)	33 (16.5)	22 (11.0)
b) Taungya	77 (38.5)	70 (35.0)	53 (26.5)
c) Alley Cropping	58 (29.0)	47 (23.5)	95 (47.5)
d) Multipurpose tree on cropland	115 (57.5)	42 (21.0)	43 (21.5)
e) Home Garden	64 (32.0)	49 (24.5)	87 (43.5)
f) Shelter belts and wind break line hedges	108 (54.0)	50 (25.0)	42 (21.0)
g) Fuel wood production	109 (54.5)	41 (20.5)	50 (25.0)
h) Tree on range land or pasture	71 (35.5)	60 (30.0)	69 (34.5)
i) Protein banks	36 (18.0)	36 (18.0)	128 (64.0)
j) Home garden involving animals	85 (42.5)	49 (24.5)	66 (33.0)
k) Multipurpose woody hedge rows	43 (21.5)	45 (22.5)	112 (56.0)
l) Apiculture with trees	62 (31.0)	55 (27.5)	83 (41.5)
m) Aqua forestry	28 (14.0)	46 (23.0)	126 (63.0)
n) Multipurpose wood lot	39 (19.5)	42 (21.0)	119 (51.5)

**Table 2:** Respondents types of Agroforestry adopted

Agroforestry Practices	Frequency	Percentage
i. Improved fallow	70	35
ii. Taungya	48	24
iii. Alley Cropping	33	16.5
iv. Shelter belts and wind break	79	39.5
v. Fuel wood production	45	22.5
vi. Tree on range land or pasture	20	10
vii. Home garden Involving animals	14	7
viii. Apiculture with trees	5	2.5
Total	314**	

**Table 3:** Respondents' perception of factors affecting adoption of Agroforestry practices

Statements	Strongly Agreed	Agreed	Disagreed	Strongly Disagreed	Total Raw Score	Mean Score
	Freq.(%)	Freq.(%)	Freq.(%)	Freq.(%)		
i. Agroforestry practice is very complex to understand	96(48.00)	20(10.00)	59(29.50)	25(12.50)	567	2.9
ii. Practice not costly to adopt	118(59.00)	17(8.50)	40(20.00)	25(12.50)	628	3.1
iii. Inputs required are easily available	129(64.50)	16(9.50)	21(10.50)	34 (17.00)	640	3.2
iv. It takes lot of time to practice	60 (30.00)	19(9.50)	88(44.00)	33 (16.50)	506	2.5
v. It has increased my land area for cultivation	142.(71.00)	6 (3.00)	17 (8.50)	35 (17.50)	796	4
vi. It affects the crop yield	124(62.00)	17 (8.50)	25 (12.50)	34 (17.00)	631	3.2
vii. Land ownership pattern affects pattern of adoption	98 (49.00)	17 (8.50)	51 (25.50)	34 (17.00)	589	2.9
viii. Practice is culturally compatible	118(59.00)	15 (7.50)	19 (9.50)	48 (24.00)	603	3
ix. It is not socially feasible	104.(52.00)	18 (9.00)	34 (17.00)	44(22.00)	572	2.9
x. Practice has high labour requirement	102 (51.00)	28(14.00)	34 (17.00)	36 (18.00)	596	3

**Table 4:** Multiple Regression result of socio-economic characteristics and adoption of Agroforestry practices

Socio economic variables	Regression coefficient	T - statistics	Standard error	Decision
Constant	9.68		-	
Age	0.159	2.224	0.001	S
Income	0.329	4.891	0.000	S
Experience	0.247	2.998	0.003	S
Farm size	-0.128	1.881	0.061	NS
Farm distance	-0.017	1.112	0.267	NS
Household size	0.293	3.926	0.000	S

R<sup>2</sup> =0.48, Adjusted R<sup>2</sup> = 0.46, At 5% level of significance

**Table 5:** Chi Square Analysis of Socioeconomic characteristic and adoption of Agroforestry practices

Socioeconomic variables	Calculated X <sup>2</sup>	Df	P-value	Decision
Gender	10.87	1	0.016	NS
Marital status	15.666	3	0.076	NS
Level of education	70.588	7	0	S
Social status	43.766	4	0	S
Social group	30.745	5	0.095	NS

9% agreed, 22% strongly disagreed while only 17% disagreed. About half of the respondents (51%) strongly agreed that there is inadequate source of information needed for the adoption of the practices. The implication of this is that farmers.

**Multiple Regression Result of Socio-economic characteristics and Adoption of Agroforestry practices**

Multiple regression result of all the variables were able to predict 48% of the factors influencing adoption of agroforestry. However, age (t=2.224), income (t=4.891), years of experience (t=2.998) and household size (t=3.926) were socio-economic factors that had significant influence on the adoption of agroforestry practices (Table 5). Ogunsumi (2004) is in agreement that age is a significant factor for adoption of technology. Year of experience was also significant, which agrees with Iwala (2004) that farming experience is related to the ability of the farmer to obtain and use information relevant to production. Farm size and farm distance were not significant. The implication of this is that, farm size and distance to the farm do not influence the use of specific agroforestry practices. This is because the selection of any agroforestry practices is not based on the size of the farm, no matter what the farm size is, agroforestry could be practiced while the choice of any agroforestry practice is not restricted to a particular location. This is consonance with the reports of Igodan *et al.* (1988) and Angba (2000).

**Chi Square Analysis of Socioeconomic characteristic and Adoption of Agroforestry practices**

Result of Chi square analysis for variables measured at nominal level showed that, level of education (X<sup>2</sup>=70.588, P=0.000), and social status (X<sup>2</sup>=43.766, P=0.000) were significant factors for adoption of agroforestry practices. This is because they enhance exposure of various respondents to sources of information which arouses the awareness and interest of the farmers. Marital status was found to be insignificant. This is because both sexes utilize agroforestry practices. This contradicted Ofuoku (2009) position that, marital status is a major determinant of adoption and sustainability of technology. Regardless of which group a farmer belongs, it does not affect adoption of technology as membership of social group was found not to be significant, but the status an individual occupied was found to be significant, the implication is that as farmer occupies a particular status within a community or social group, the probability of adopting and participating in new improved technology increases.

**CONCLUSION**

This study has explored agroforestry practices of Nigeria with a major focus on the expenses at two Southwest states. The study analyzed the uses and roles of farmers’ activities in combating the growing incidence of environmental

degradation in the areas. Considering the rate at which the country has been losing her forested land areas, agroforestry has gradually emerged as a viable tool to minimize the trend. The analysis in the study areas revealed the growing adoption of agroforestry with sustained environmental and economic benefits. It has been shown that various determinants cutting across personal factors, social factors and environmental factors contributed to adoption and sustainability of agroforestry practices in the study area.

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