Adoption of Sustainable Forest Practices by Farmers in Niger State, Nigeria

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ABSTRACT

The study examined adoption of sustainable forest practices by farmers in Niger State, Nigeria. To achieve the study objectives, 233 respondents were randomly selected for the study and data were collected using validated interview schedule with reliability coefficient of 0.87. Data collected were analyzed using descriptive statistics and regression model. Result indicated that majority (72.5%) of the respondents were male, while 27.5% had secondary education. Village heads (88.0%), radio (85.0%) and cooperative societies (72.0%) were the major sources of information for sustainable forest practices. Result further revealed that adoption of forest practices such as controlling of excessive felling of forest trees (89.5%), felling of only mature trees (89.2%), controlling/restriction of bush burning (81.4%), restricting of excessive harvesting of non-timber forest resources (77.7%) and practicing of taungya/mixed farming system (73.7%) were sustainable. Factors that influenced adoption were household size, farming experience, income, cooperative societies and extension contacts. Perceived benefits of adoption include sustenance of forest resources and improvement in living standard. Therefore, it was recommended that more awareness should be created through village heads, radio and cooperative societies on the unsustainable forest practices in order to improve their level of adoption. Also, sufficient tree seedlings should be provided to enable farmers replace felled trees and practice afforestation.

Keywords: Farmers, Innovation adoption, Niger state, Sustainable forest, Niger state Trees

INTRODUCTION

Over the dacades the concept of sustainability has virtualy moved to the main stream of economy development. World Bank (2013) reported that over four hundred thousand hectare of forestland is been destroyed through various human activities leading to annual deforestation of 3.5% which has resulted to severe local and global environmental damages. In Nigeria particularly in the Northern States, there is an increasing concern to conserve forest resources. Human in their quest for livelihood support have embarked on so many activities, some of which are detrimental to the environment, hence, causing or contributing to deforestation through clearing of forest for farming, wood extraction for fuel charcoal and construction, bush burning, overgrazing as well as shifting cultivation and urbanization.

More recently, FAO (2014) estimated that Nigeria losses about 3.7% of its forest annually and this have resulted to highest net loss of forest from year 2000 to 2010 partly because of lack of adoption of sustainable forest practices. Incidentally, most studies on forestry in Nigeria concentrated on management of the forest stand and capacity of the forest to sustain certain level of commercial timber production, study on the level of adoption of sustainable forest practices have not been fully documented in Niger State, which has the largest land mass in Nigeria where a lot of forest resources are exploited and utilized. It is against this background that this study was carried out to cast light on the nature of sustainable forest strategies practiced in the study area to ascertain whether the sustainability practices are active or passive. Besides, the study would also appraise the scanty studies on forestry in the area which have previously focused on forest output and over-looking the need to know whether there is sustainability or maintenance culture of forest trees in the first place. The specific objectives of the study are to: describe the socio-economic characteristics of respondents; determine sources of information for sustainable forest practices; determine adoption of sustainable forest practices; identify factors affecting adoption of sustainable forest practices and ascertain perceived benefits of adoption of sustainable forest practices in the study area.

METHODOLOGY

The study was conducted in Niger State located in the Guinea Savannah ecological zone of Nigeria. The State is located within Latitudes 8– 10°N and Longitudes 3 – 8°E, with annual growth rate of 3.4%, the State has estimated population of 5,337,149 in 2015. About 85% of the people of the State are farmers (Niger State GIS, 2007).

Annual rainfall ranges from 1,100mm in the northern part to 1,600mm in the southern part of the State. The mean average temperature is around 32°C. Some of the crops grown in the State are

yam, cotton, maize, sorghum, millet, cowpea, soybean, beans, rice and groundnut. While some of the tree crops cultivated are mango, citrus, coconut, cashew, banana, pawpaw. Livestock reared include goat, sheep, cattle, chicken, camel and donkey.

Multistage sampling technique was adopted for the selection of respondents for this study. The first stage was purposive selection of three Local Government Areas namely Lapai, Gurara and Wushishi from Agricultural Zones I, II and III respectively, because of the presence of forest area in those localities. The second stage involved purposive selection of three villages within forest areas in each of the selected Local Government Area. This gave a total of 9 villages. The third stage was simple random selection of 22% of farmers from the selected villages. In all, a total of 233 respondents were selected for the study from the sampling frame of 1060 farmers established through village heads with the assistance of village extension agents attached to the localities sampled.

Content validity of interview schedule was ensured through expert consultation. The validated interview schedule which was subjected to Cronbach's Alpha reliability test (r=0.87) was used for data collection in June, 2015. Data were collected on socio-economic characteristics, sources of information, adoption of sustainable forest practices (controlling of excessive felling of forest trees, felling of only matured forest trees, controlling / restriction of bush burning, restricting of excessive harvesting of non-timber forest resources, practicing of taungya/mixed farming system, practicing of prolong fallow system, using of prune trees for wood and charcoal production instead of felling the entire forest tree, controlling / restriction of excessive hunting of wildlife in the forest, planting of two forest tree seedlings to replace one matured tree harvested, practicing of massive afforestation) and perceived benefits of adoption of sustainable forest practices. Socio-economic characteristics such as age, educational level and farming experience

were measured in years. While household size, cooperative membership and extension contact were measured in numbers. Income and farm size were measured in naira and hectare respectively, while sex was measured as male or female. Sources of information was determined by asking respondents to indicate their sources of information. Adoption of sustainable forest practices were measured using four point Likert type scale of always practice = 4, sometime practice = 3, hardly practice = 2, and not practice = 1. Benefits of adoption were determined by asking the respondents to indicate the perceived benefits of adoption of sustainable forest practices. Descriptive statistics were used to achieve objectives one, two and five. Objectives three and four were achieved using Farmers Sustainability Index (FSI) and Linear Regression model, respectively.

Farmers Sustainability Index (FSI) Specification:

Taylor *et al*. (1993) developed Farmers Sustainability Index (FSI) for determining the adoption of sustainable practices by the farmers. In related studies, Mohammed *et al*. (1994); Binoo and Vijayaragavan (2001) adopted this index. In this study, the Farmers Sustainability Index (FSI) was used to achieve objective three of the study. For the purpose of interpretation, any practice with FSI score less than 50% is considered unsustainable and any practice with FSI score more than 50% is considered sustainable, while FSI of 50% is considered as neutral score. The index is specified as:

$$\text{FSI Score} \quad \frac{(\text{Unadjusted score} - \text{Minimun score}}{(\text{Maximum score} - \text{Minimum score}} \text{ X } 100$$

Linear Regression model is explicitly specified as:

$$Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + U$$

Where;

Y = adoption scores

X_1 = age (years)

X_2 = educational level (years)

X_3 = income (naira)

X_4 = farm size (hectares)

X5 = household size (numbers)

X6 = farming experience (Years)

X7 = cooperative society membership (numbers)

X8 = extension contact (numbers)

X9 = sex (Male=1, Female=0)

b_o = constant term

$b_1...b4$ = coefficients

U = error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Table 1 revealed that majority (72.5%) of respondents were male while 27.5% of the respondents were female. This could be due to the fact that male are more involved in agricultural production in the study area than female. The finding agreed with the finding of Ogunlade (2007) who reported that male dominates agricultural activities in most part of Nigeria. Table 1 showed that the mean age of the respondents was 41.5 years which implies that the respondents were active youths who could easily key-in to new innovation or practice. The finding in Table 1 indicated that 51.1% of the respondents had between 6-10 household sizes. Farmers with large household sizes will have access to unpaid family labour which could facilitate adoption of sustainable forest practices. Result in Table 1 showed that 39.9% of the respondents had between 11-20 years of farming experience, while 32.6% of the respondents had farming experience of between 21-30 years. Similarly, finding in Table 1 showed that 30.0% of the respondents had no formal

education. On the other hand, 27.9%, 22.8% and 19.3% of the respondents had secondary, primary and tertiary education, respectively. The result suggests that more than one quarter of the respondents had no formal education. This may likely affect respondents access to information needed to make a decision on the adoption of sustainable forest practices.

Result in Table 1 revealed that 47.7% of respondents had farm size ranges of 1-5 hectares. This implies that about half of the respondents were small-scale farmers. Also, the result in Table 1 indicated that the mean income of the respondents was ₦167,383. Farmers with higher income will have more access to resources needed for the effective adoption of sustainable forest practices. Umar *et al.* (2006) reported that farm income had a significant relationship with the adoption of improved technologies and practices. Furthermore, result in Table 1 revealed that 85.0% of respondents were members of one co-operative society. Entries in Table 1 also showed that 58.4% of respondents had only one extension contact in a year. Frequency of visit by extension agents is expected to improve the attitude of farmers towards adoption of sustainable forest practices.

Table 1: Socio-economic characteristics of respondents

Variables	Frequency	Percentage
Gender		
Male	169	72.5
Female	64	27.5
Age (years)		
21-30	46	19.7
31-40	79	33.9
41-50	70	30.1
51-60	28	12.0
Above 60	10	4.3

Mean	41.5	
Household size (No)		
1-5	63	27.0
6-10	119	51.1
11-15	36	15.5
16-20	9	3.9
Above 20	6	2.5
Farming experience (years)		
1-10	38	16.4
11-20	93	39.9
21-30	76	32.6
31-40	18	7.7
Above 40	8	3.4
Educational level		
Primary	53	22.8
Secondary	65	27.9
Tertiary	45	19.3
No-formal	70	30.0
Farm size (ha.)		
1-5	111	47.7
6-10	97	41.6
11-15	15	6.4
16-20	9	3.9
Above 20	1	0.4
Income (₦)		
1-100,000	57	24.5
101,000-200,000	103	44.2
201,000-300,000	32	13.7
301,000-400,000	21	9.0

Above 400,000	20	8.6
Mean	₦167,383	
Cooperative membership		
Membership of one	198	85.0
Membership of two	35	15.0
Extension contacts		
One contact	97	41.6
Two contacts	136	58.4

Sources: Field survey, 2015

Sources of Information for Sustainable Forest Practices

For individual method, Table 2 indicated that village heads (88.0%) were the major source of information for sustainable forest practices in the study area; this was followed by extension agents who provided information for 58.8% of the respondents. Similarly, findings for group method revealed that 72.0% of the respondents got information through cooperative societies, while 64.4% of the respondents sourced information through village meetings. Moreover, Table 2 showed that 85.0% of respondents received information through radio. Furthermore, result of the ranking indicated that village heads were the major source of information in the area on sustainable forest practices which ranked 1st, while radio ranked 2nd. Cooperative societies and village meetings ranked 3rd and 4th, respectively. This implies that radio and cooperative societies also played very essential role in providing information to the respondents on sustainable forest practices in the study area. This is in agreement with the finding of Arokoya (2003) who reported that radio provide information to the generality of farmers in Nigeria.

Table 2: Sources of Information for sustainable forest practices

Sources*	Frequency	Percentage	Ranking
Individual method			
Extension agent	137	58.8	5th
Friend/ neighbour	104	44.1	7th
Village head	205	88.0	1st
Relative	71	30.5	8th

Contact farmer	31	13.3	10th
Group method			
Seminar/Workshop	15	6.4	12th
Agric show	20	8.6	11th
Village meeting	150	64.4	4th
Cooperative society	169	72.0	3rd
Farm center	10	4.3	14th
Research station	11	4.7	13th
Mass media method			
Television	106	45.0	6th
Radio	199	85.0	2nd
Newspaper	37	15.9	9th
Magazine	4	1.7	15th
Bulletine	2	0.9	16th
News letter	2	0.9	16th

Sources: field survey, 2015
*Multiple responses

Adoption of Sustainable Forest Practices

Table 3 showed that the adoption of the following practices were sustainable in the study area namely controlling of excessive felling of forest trees (89.5%), felling of only matured forest trees (89.2%), controlling / restriction of bush burning (81.4%), restricting of excessive harvesting of non-timber forest resources (77.7%) and practicing of taungya/mixed farming system (73.7%). The sustainability of adoption of the above practices may be due to the influence of some of the socio-economic attributes such as income, co-operative membership and extension contact as shown by Table 4 of this study. However, the adoption of forest practices such as prolong fallow system (48.1%), using of prune trees for wood and charcoal production instead of felling the entire forest tree (39.4%), controlling / restriction of excessive

hunting of wildlife in the forest (37.2%), planting of two forest tree seedlings to replace one matured tree harvested (20.7%) and practicing of massive afforestation (20.3%) were not sustainable in the study area. Reasons for not adopting some of these sustainable forest practices were inadequate land for practicing fallowing system, lack of seedlings for afforestation and replacement, absence of alternative complementary business other than wood production and charcoal making as well as insufficient alternative source of cooking energy and animal protein.

Table 3: Adoption of sustainable forest practices

Sustainable forest practices	Adoption index	Remarks
Controlling of excessive felling of forest trees	89.5%	Sustainable
Felling of only mature trees	89.2%	Sustainable
Controlling / restriction of bush burning	81.4%	Sustainable
Restricting excessive harvesting of non-timber forest resources	77.7%	Sustainable
Practising of taungya and mixed farming system	73.7%	Sustainable
Practising of Prolong fallow system	48.1%	Unsustainable
Pruning trees for charcoal and wood production instead of felling the entire trees	39.4%	Unsustainable
Controlling/restriction of excessive hunting of wildlife in the forest	37.2%	Unsustainable
Planting two forest tree seedlings to replace one matured tree harvested	20.7%	Unsustainable
Practicing of massive afforestation	20.3%	Unsustainable

Sources: Field survey, 2015
1-49% Unsustainable score

50%-Neutral score
51-100 Sustainable score

Factors Affecting Adoption of Sustainable Forest Practices

The value of the coefficient of determination (R^2) in Table 4 indicated that 42.2% variation in the adoption of sustainable forest practices was explained by the independent variables included in the model. The result further revealed that seven variables had significant influence on the adoption of sustainable forest practices. These include: age (-1.202299), house hold size (1.994161) farming experience (.5108178), income(.0000454), co-operative membership (12.82997) and extension contacts (10.74448) which were significant at 1% level of probability, while farm size was significant at 5% level of probability. The positive coefficients of the household size, farming experience and income indicated that household size, years of experience and income were significant dominant factors that influence the level of adoption of sustainable forest practices in the study area. Moreover, cooperative membership and extension contacts both had significant positive effects, which suggest that more access to extension services will significantly improve level of adoption of sustainable forest practices. The positive regression coefficient with respect to cooperative membership shows that when a farmer belong to more cooperative societies, there is the likelihood of increase in the level of adoption of sustainable forest practices in the study. Umar *et al.* (2009) stressed that household size, farming experience and income influenced adoption of improved technologies and practices. The result indicated inverse relationship between age and adoption of sustainable forest practices; this implies that increase in age to some certain extent may result to decrease in the adoption of sustainable forest practices due to conservativeness. Farm size was also negatively significant which suggests that increase in farm size will lead to decrease in the level of

adoption of sustainable forest practices; this may be attributed to deforestation that may take place as a result of expansion of farm lands.

Table 4: Factors affecting adoption of sustainable forest practices

Factors	Coefficients	Standard errors	t-values	p-values
Farm size	-7.371682	3.570535	-2.06	0.040**
Age	-1.202299	.1938492	-6.20	0.000***
Family size	1.994161	.5260101	3.79	0.000***
Farming experience	.5108178	.187056	2.73	0.007***
Educational level	-.1225526	.2750031	-0.45	0.656
Sex	-.9579356	.566624	-1.69	0.092
Income	.0000454	.0000159	2.86	0.005***
Cooperative membership	12.82997	3.808527	3.37	0.001***
Extension contacts	10.74448	3.139558	3.42	0.001***
Credit	-5.14907	3.047829	-1.69	0.093

Source: Field survey, 2015
F value = 0.000
R-squared=0.4225
Adj R-squared =0.3965
*** = significant at 1% level of probability

**=significant at 5% level of probability

Perceived Benefits of Adoption of Sustainable Forest Practices

Result in Table 5 revealed that all (100%) of the respondents stressed that adoption of sustainable forest practices helped in sustaining forest resource, which satisfy the present needs and that of the future of the farmers. Similarly, all (100%) of the respondents indicated that adoption of sustainable forest practices has improved their living standard in terms of employment and income generation as well as provision of foods, health care and raw materials. This result affirms the findings of Ajake (2012) who reported that sustainable forest practices would generate employment, income and raw materials. Furthermore, 99.1%,   84.9%, 73.1% and 54.7% of the respondents, respectively stressed that adoption of sustainable forest practices increased diversification of agricultural production, protect environment, preserve the ecosystem and reduce the adverse effects of climate change. Also, Richard *et al.* (2009) reported that sustainable forest practices can reduce environmental and land degredations, green house gases and gaining other co-benefits

Table 5: Perceived benefits of adoption of sustainable forest practices

Perceived benefits*	Frequency	Percentage
Sustain forest resources	233	100.0
Improvement in living standard of farmers	233	100.0
Protection of environment	198	84.9
Increase diversification of agricultural production	231	99.1

Reduce adverse climate change effects	128	54.7
Preservation of the ecosystem	173	73.1

 Sources: Field survey, 2015
*Multiple response

CONCLUSION

From the findings of this study, it was concluded village heads, radio and cooperative societies were the major sources of information for sustainable forest practices. The adoption of sustainable forest practices such as controlling of excessive felling of trees, felling of only matured trees, controlling / restriction of bush burning, restricting excessive harvesting of non timber forest resources and practising of taungya and mixed farming system were sustainable in the study area. Factors influencing adoption of the sustainable forest practices were household size, farming experience, income, cooperative membership and extension contacts. Benefits derived from adoption of sustainable forest practices included sustenance of forest resources, improvement in living standard, increase in diversification of agricultural production and protection of environment.

RECOMMENDATIONS

More awareness should be created by extension agents through village heads, radio and cooperative societies on adoption of sustainable forest practices such as land fallowing, prunning of trees for charcoal and wood production instead of felling the entire tree, restricting of excessive hunting of wildlife in the forest and planting of two tree seedlings to replace one

tree harvested in order to improve the level of adoption of these sustainable practices in the study area.

Adequate tree seedlings should be provided to the farmers by State Forestry Department or through communities nursery farms to enable farmers practice massive afforestation and replace fell trees. Other alternative source of cooking energy and means of livelihood such as off-farm activites should be encouraged in the study area to reduce over dependence on forest trees for charcoal making.

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