Livelihood Diversification Among Rural Forest Dwellers in Akwa-Ibom, Nigeria: A Multinomial Logit Approach

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Abstract

This study was carried out to determine the factors influencing the involvement of some rural forest communities' livelihood diversification strategies in Akwa Ibom State, Nigeria. The multi-stage sampling technique was used to select 100 respondents for this study. The first stage involved the purposive selection of three local government areas (LGAs): Esit Eket, Mbo, and Ibeno, where the forest reserve is located. The second stage involved the random selection of ten villages from the three LGAs. The third stage comprised the random selection of ten respondents from each of the selected ten villages. Descriptive statistics such as frequency, percentage, as well as inferential statistics such as the multinomial logistic regression were used in the study. The results of the multinomial logistic regression show that total household income, household size, farm size, educational qualification, access to extension service, farming experience and forest availability were the factors that significantly influenced the respondents' choice of livelihood strategies in the study area. Policies that will encourage diversification in order to broaden opportunities that will

lead to increase in income and improve rural household livelihood should be encouraged.

Key words: Livelihood, Strategies, Akwa Ibom, Multinomial, Forest dwellers

Introduction

Forest and forest products play important roles in sustaining the livelihoods of communities living around the forest areas. They provide livelihood to a great proportion of the world's population. Forests are often portrayed as central to the poverty alleviation efforts of millions of rural smallholders across the developing world (Sunderlin et al., 2005; Sunderlin, 2006; Shackleton et al., 2007; Wunder et al., 2014). Even when only the officially reported monetary contributions of forests to developing world economies are taken into account, they exceed US$ 250B — more than twice the value of total development assistance and more than the annual global output of gold and silver combined (Agrawal et al., 2013). Forest resources which are grouped into timber and non-timber forest products are useful for various purposes, such as fuel, wood, construction materials, medicine, and food. Forest resources are a source of energy, employment and other subsistence needs for the majority of local communities, especially in developing countries (Bahuguna, 2000). They contribute significantly to household income, food security, and household healthcare (Endamana et al., 2016; Ojea et al., 2016). However, forest dwellers not only depend on forest-related activities, but also diversify their means of livelihood into occupations like agriculture, hunting, business-related work, daily labour work and seasonal migration, etc.

Livelihood diversification is recognized as the process by which rural households construct an increasing diverse portfolio of activities in order to survive and improve their standard of living (Ellis, 2000). Various motives inform the diversification of the activities of households, including risk reduction, reaction to crisis, response to diminishing factor returns, to realize strategic complementarities between activities or to exploit the comparative advantages of technologies, skills or endowments (Barrett et al., 2001). Access to forest or tree resources helps rural households diversify their livelihood base and reduce their exposure to risk. It provides a crucial safety net in times of economic distress, helping them to offset agricultural income

lost due to weather shocks, crop failure, or changes in commodity prices. In addition, forest dwellers diversify their livelihood activities because jobs in forest areas are not available all year round, leading to seasonal unemployment and dependence on forest-related activities such as collection of non-timber forest products (NTFPs). The survival needs of rural dwellers are often met with forest resources. Forests provide self-consumption needs as well as income from the sale of NTFPs for villagers. People use leaves, firewood, fodder, fruits, medicinal herbs, etc.; and for both self-consumption and earning from the forest.

Over 60 per cent of the Nigerian population live in the rural areas and depend largely on farming and the exploitation of natural resources for their livelihood. Studies have revealed that the poverty level in Nigeria is higher in the rural areas than in urban areas. This situation is exacerbated by the low level of development coupled with population growth, which has led rural people to overly rely on farming and the exploitation of natural resources. The accompanying increase in poverty levels has compelled residents of rural economies to embark on livelihood diversification strategies, including on-farm (crop, fisheries and livestock) and off-farm activities or market and non-market activities, to mitigate the risks inherent in unpredictable agro-climatic and politico-economic circumstances (Irohibe and Agwu, 2014; Edet and Etim, 2018; Asfaw et al., 2017). In addition, decline in soil fertility, due to the overuse of land and unfavourable climatic conditions, risk and uncertainty, and seasonality faced by the agricultural sector in Nigeria, has compelled rural dwellers to come up with coping strategies such as diversification to reduce household vulnerability. According to Gordon and Craig (2001), the growing interest in research on rural off-farm and non-farm income in rural economies is increasingly showing that rural peoples' livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture as previously assumed.

Different studies have been conducted to investigate livelihood diversification among rural households. Banjo et al. (2018) worked on livelihood diversification strategies (LDS) among rural dwellers in Oluyole Local Government Area of Oyo State. The study classified LSD into three major categories, which are on-farm, non-farm and off-farm activities, but did not examine the factors influencing the choice of the livelihood diversification strategies. Edet and Etim (2018) in their study also

investigated the factors influencing rural farmers' livelihood diversification in Akwa Ibom State. The study was conducted among 150 rural farmers. The Tobit regression model was used to analyse the factors influencing rural livelihood diversification in Akwa Ibom State. The study, however, did not break down the choice of livelihood diversification strategies influencing the socioeconomic characteristics used in the study. Nasa'i et al. (2012)also worked on factors influencing rural farmers' engagement in livelihood diversification in Giwa Local Government Area of Kaduna State. The study identified the different levels of farmers' engagement in livelihood diversification and also determined the socio-demographic factors that influence farmers' decision for livelihood diversification. The authors classified the livelihood diversification into high level and low level of livelihood diversification activities. This study, therefore, will go a step further in identifying the types of livelihood strategies adopted by forest dwellers in the study and also consider the factors that influence their choice of livelihood strategies. As has been stated earlier, the agricultural sector alone cannot be relied upon for the core activity of rural households as means of income generation, improving livelihood and reducing poverty. Therefore, understanding the importance of non-farm and off-farm activities will give policy makers insight for designing agricultural and rural development policies that will encourage livelihood diversification and increase the welfare of the rural populace.

Methodology

This study was conducted in communities around Stubb's Creek Forest Reserve in Akwa Ibom State, located in the coastal South-South region of Nigeria. The region is popularly called the Niger Delta region or the oil rich region of Nigeria. The state is located between latitudes 4° 33′ and 5° 33′ N and longitudes 7° 25′ and 8° 25′ E. It has a total land area of 7,246km^2. It is bordered in the east by Cross River State, in the west by Rivers and Abia states, and in the South by the Atlantic Ocean. Akwa Ibom State has a population of about 3,902,051 (NPC, 2006). Presently, the Stubb's Creek Forest Reserve (SGFR) is the largest gazetted forest reserve in Akwa Ibom State, covering an area of 310.80km^2 , spread over three local government areas — Esit Eket, Ibeno and Mbo — and extending from Qua Iboe River to the Cross River Estuary (Aweto, 1995; Ekpo, 2001; Udoh & Nwibo, 2011). The main crops grown in the area include cassava, cocoyam, yam, maize, melon, okra and vegetables (green, fluted pumpkin, water-leaf

and bitter leaf). The livestock reared include: sheep, goats, pigs and poultry, while fish is also cultured. The occupations of the people include fishing, palm wine tapping, farming, weaving, and craftwork.

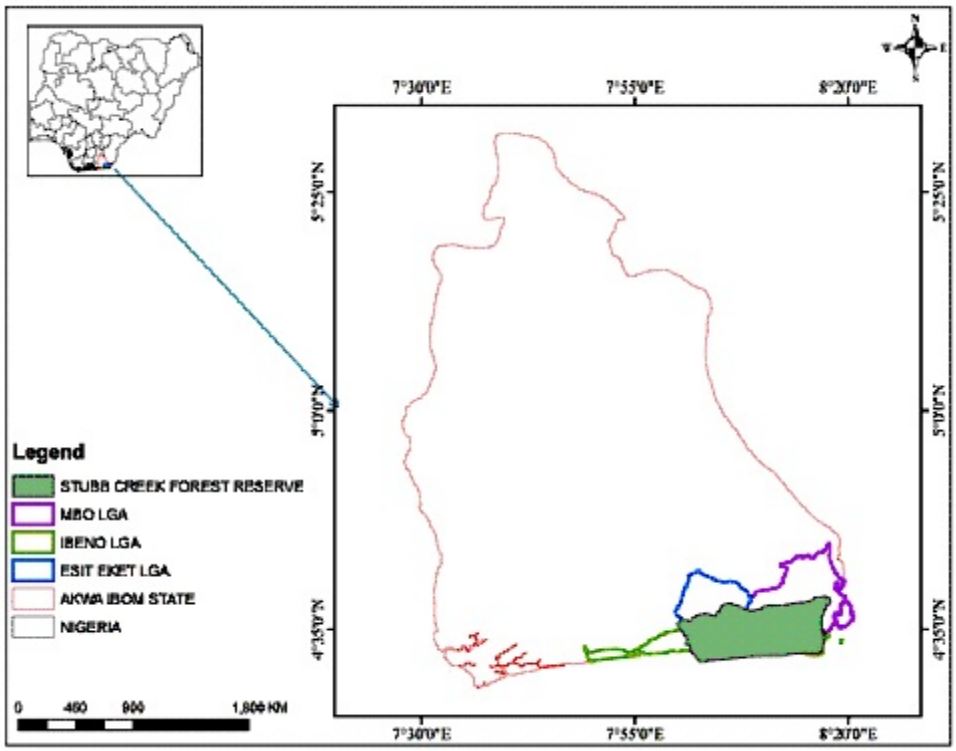

Figure 1: Map of Akwa Ibom State showing study area.

Source: Forestry Research Institute of Nigeria.

Sampling technique and sample size

The multi-stage sampling technique was used to select respondents for this study. The first stage involved the purposive selection of the three local government areas (LGAs): Esit Eket, Mbo and Ibeno, where the forest reserve is located. The second stage involved the random selection of ten villages from the three LGAs (at ratio 5:3:2 based on size). The third stage comprised the random selection of ten respondents from each of the selected ten villages making a total of one hundred (100) respondents. Accordingly, 50, 30, and 20 respondents were sampled from Ibeno, Mbo and Esit Eket

LGAs respectively. Primary data for the study were collected through the use of questionnaires distributed to respondents in the study area.

Method of Data Analysis

Data collected were analysed through descriptive statistics such as frequency and percentage. Inferential statistics such as multinomial logistic regression were also used to identify factors that influenced households' choice of livelihood strategies in the study area. The data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 23 and STATA 12.

Multinomial logit model specification

The multinomial logit or multinomial probit regression models are used when there is a dependent variable with more than two alternatives among which a decision maker has to choose. With respect to estimation, they both estimate the effect of explanatory variables on the dependent variable involving multiple choices with unordered response categories (Greene, 2000). However, multinomial probit is rarely used in empirical studies due to estimation difficulty imposed by the need to solve multiple integrations related to multivariate normal distribution (Yirga, 2007). Moreover, the multinomial logit model is selected not only due to computational ease, but because it exhibits a superior ability to predict livelihood diversification and identifies the differences between the livelihood strategies of rural households (Keane 1992; Chan 2005). It is a simple extension of the binary choice model and is the most frequently used model for nominal outcomes that are often used when a dependent variable has more than two choices.

According to literature, the multinomial logit model is a widely used technique in applications that analyse 'polytomous' response categories in different areas of economic and social studies. Wassie, Colman and Bichaka (2008) stated that the multinomial logit model is an important model to use in examining the determinants of household livelihood strategy choices among alternative livelihood strategies. For this study, three mutually exclusive livelihood diversification strategies were identified. These include *on-farm only*, *non-farm only* and *on-farm plus non-farm* strategies. Therefore, to identify the determinants of forest dwellers' decision to choose which livelihood diversification strategy to adopt, the multinomial logit model was

used. The assumption is that in a given period, a rational household head will choose among the three livelihood strategies that which would offer maximum benefit.

Therefore, following Greene (2003), suppose for the i^{th} respondent faced with j choices, the utility choice j can be specified as:

$$U_{ij} = Z_{ij}\,\beta + \varepsilon_{ij} \quad (1)$$

If the respondent makes choice j in particular, then U_{ij} is the maximum among the j utilities. So the statistical model is derived by the probability that choice j is made, which is:

$$\text{Prob}\,(U_{ij} > U_{ik}) \text{ for all others } K \neq j \quad (2)$$

where; U_{ij} is the utility to the i_{th} respondent from livelihood strategy j; and
U_{ik} is the utility to the i_{th} respondent from livelihood strategy k.

Thus, the i^{th} household's decision can be modelled as maximizing the expected utility by choosing the j^{th} livelihood strategy among J discrete livelihood strategies, that is:

$$\text{Max}_j = E\,(U_{ij}) = f_j\,(x_i) + {}_{ij}, \quad j = 0 \ \ldots \ J \quad (3)$$

In general, for an outcome variable with J categories let the j_{th} livelihood strategy that the i_{th} household chooses to maximize its utility take the value 1 if the i_{th} household chooses j_{th} livelihood strategy and 0 if otherwise. The probability that a household with characteristics x chooses livelihood strategy j, P_{ij} is modelled as:

$$P_{ij} = \frac{\exp^{(X'i\beta j)}}{\Sigma_{j=0}^{J} \exp^{(X'i\beta j)}} \qquad j=0 \quad (4)$$

with the requirement that $\Sigma_{j=0}^{J} Pij = 1$ for any i

where:

P_{ij} = probability representing the i_{th} respondent's chance of falling into category j,

X_i = predictors of response probabilities, and

β_j = covariate effects specific to j_{th} response category with the first category as the reference.

A convenient normalization that removes indeterminacy in the model is to assume that $\beta_1 = 0$ (Greene, 2003).

Description of variables used in multinomial logit model

The dependent variable in this study was the selection of different livelihood strategies by farm households. This was identified by categorizing the sampled households into livelihood strategy groups based on their choices. Therefore, the polytomous dependent variable for multinomial logit was hypothesized as Y_i = 3 unordered categories of livelihood strategies; where Y_1= those that adopted on-farm strategy only, Y_2= those who engaged in non-farm strategy alone and Y_3= those that used both on-farm and non-farm strategies. Y_1 was therefore chosen as the reference category.

The general regression model in its explicit form is expressed as:

$$Y_i = a + \beta_1 X_1 + \ldots \beta_n X_n + e \quad (5)$$

Y_i = livelihood strategies adopted by households

where:

Y_1 = Adopters of On-farm strategy only

Y_2 = Adopters of Non-farm strategy only

Y_3 = Adopters of both On-farm and Non-farm strategies

X_1(THI) = Total household income (in naira)

X_2(MS) = Marital status (married =1 not married = 0)

X_3(HHS) = Household size (numbers)

X_4(AGE) = Age of respondent (years)

X_5(FS) = Farm size (hectares)

X_6(AES) = Access to extension services (access = 1, otherwise = 0)

X_7(EDUC) = Educational qualification of respondent (years)

X_8(MOA) = Membership of association (member = 1, otherwise = 0)

X_9(FE) = Farming experience (years)

X_{10}(FA) = Forest availability in area (availability = 1, otherwise = 0)

Results and Discussion

The socioeconomic characteristics of the respondents are presented in Tables 1 and 2. The study revealed that the proportion of male respondents (52%) was higher than females (48%). The majority of the respondents were married (58%), followed by single (35%). The age distribution of the households shows that 44% of the respondents were below the age of 30 and 42% were within the age group of 30-50 years. The group above 50 years only constituted 14%. This shows that the majority of the respondents were in their active age group and will most likely be involved in other activities (forest inclusive) to support their livelihood means, which is in line with the finding by Yemiru et al. (2010). The majority of the respondents (50%) had household size of between 6 and 10 members, 21% had households with between 11-15 members while 4% had more than 15-member households. Respondents that had between 1 and 5 members 25% were the least. This shows that most of the forest dwellers in the study area have large households. The result corroborates Banjo et al. (2018), who reported that typical forest environment dwellers have large household sizes. The distribution of the respondents according to educational qualification reveals that most of the respondents are educated; 50% had tertiary education and 10% and 35% had primary and secondary education respectively. Only 5% had no formal education. The educational level of the respondents will probably enhance their ability to make accurate decisions on livelihood diversification.

The study also revealed that 6% of the respondents carried out their farming activities on government land, 24% on purchased land, 55% on land acquired through inheritance, while 15% of the respondents rented land for their farming activities. The result of the livelihood strategies adopted by the respondents shows that 12% practiced on-farm activities only, 17% engaged in non-farm activities alone, while 71% took on both. This result reveals that most respondents in the study area combined on-farm and non-farm

activities the major livelihood strategies to generate income. This is the common trend among rural farmers in the developing world, whereby farmers augment their income from farming activities by engaging in other extraneous activities during the intervening period between planting and harvesting of food crops.

Table 1: Distribution of the socioeconomic characteristics of the respondents

Characteristics	Frequency	Percent	Mean
Gender			
Male	52	52	
Female	48	48	
Age Category			47.6
Below 30	44	44	
30-50	42	42	
Above 50	14	14	
Marital Status			
Married	58	58	
Single	35	35	
Widowed	4	4	
Divorced	3	3	
Household Size Group			9
1-5	25	25	
6-10	50	60	
11-15	21	21	
>15	4	4	
Educational Qualification			
No Formal education	5	5	
Primary education	10	10	
Secondary education	35	35	
Tertiary education	50	50	

Source: Field survey, 2018.

The distribution of the respondents according to farm size shows that farmers with 1 acre (36%) and 2 acre (37%) farms constituted the majority. Only 4% had more than 4 acres of farmland. The distribution of the respondents according to their farm experience shows that most of the respondents (73%) had more than 5 years farming experience. The

implication of this is that the more experience a farmer has in farming activities, the more likely it is that he will diversify his livelihood means to cater for his needs during off-farming seasons.

Table 2: Distribution of respondents according to land acquisition, occupation, farming experience and farm size

	Frequency	Percentage
Mode of Land Acquisition		
Government land	6	6
Purchased land	24	24
Inherited land	55	55
Rented land	15	15
Occupation/ livelihood Strategy		
On-farm only	12	12
Non-farm only	17	17
On farm and Non-farm	71	71
Farming Experience (Years)		
≤5	27	27
6 – 10	26	26
> 10	47	47
Farm Size (Acres)		
1	36	36
2	37	37
3	14	14
4	9	9
>4	4	4

Table 3: Distribution of respondents according to income generated from the different livelihood diversification strategies

Range of respondents monthly income (₦)	On-farm only	Non-farm only	On-farm with Non-farm	Average
<40,000	8	5	4	
40,001- 80,000	3	7	41	41,420
Above 80,000	1	5	26	

Source: Field survey, 2018.

Factors influencing the choice of livelihood strategies

The multinomial logit model was used to assess the factors that influence the respondents' choice of livelihood strategies. The dependent variable is the livelihood strategies (on farm, non-farm, on-farm and non-farm) adopted by the respondents. A value of 1 was allotted to respondents that adopted on-farm strategies only, 2 to non-farm strategies only and a value of 3 for respondents that adopted both on-farm and non-farm strategies. Table 4 shows the result of the maximum livelihood method that was employed to estimate the parameter of the multinomial logit model. The results reveal that only three independent variables out of ten were found to significantly influence respondents' choice of non-farm strategies, while seven of the variables statistically influenced their choice of on-farm with non-farm strategies.

Table 4: Factors influencing the choice of livelihood strategies among forest dwellers

	Non-Farm			Non-Farm with On Farm		
Variables	Coeff.	Odd Ratio	P-value	Coeff.	Odd Ratio	P-value
TMI	2.110	8.248	0.014*	1.118	3.058	0.039*
MS	0.61	1.852	0.380	0.684	0.684	0.436
HHS	0.730	2.075	0.260	2.455	11.646	0.034*
AGE	-0.566	0.568	2.176	0.838	0.838	0.558
FS	0.731	2.077	0.810	2.247	2.247	0.008*
AES	1.367	3.924	0.013*	3.279	26.535	0.010*
EDUC	1.793	6.007	0.021*	1.144	3.139	0.017*
MOA	-1.649	0.192	0.117	0.426	1.531	0.498
FE	-1.830	0.160	0.318	1.004	2.729	0.041*
FA	-1.134	0.322	0.466	1.149	3.155	0.005*

*Significant at 5%

***Source*:** Field survey, 2018.

The results indicate that total household income (THI), household size (HHS), farm size (FS), educational qualification (EDUC), access to extension services (AES), farming experience (FE) and forest availability (FA) were factors that influenced the respondents' choice of livelihood

strategies in the study area. The multinomial logit estimates are reported for only two out of the three categories of livelihood strategies. The first category which is on-farm only was used as the reference category against the choice of the other two categories.

It was also observed from the results that respondents with forests available in their areas were more likely to diversify into non-farm activities as additional sources of income due to limited availability of farmland. Adugna, (2008) and Fikru (2008) stated that farmers with smaller land size were involved in off-farm diversification activities because of shortage of land to support their livelihood. The non-farm activities that are available to those with forests in their areas include: collection of fuel wood for sale, gathering of leaves both for personal use and sale, lumbering, bush meat and other non-timber forest products (NTFPs) obtained from the forests for sale.

The model results indicate that respondents' total monthly income, access to extension services and educational qualification significantly influenced their choice of both non-farm only as well as non-farm with on-farm strategies relative to on-farm only as sources of livelihood at 5% level of significance. This implies that respondents with high educational level (X_7), better monthly income and access to extension agents are more likely to diversify livelihood strategies into non-farming and/or off-farming activities than those with lower educational qualification, lower income, and no access to extension services. In other words, respondents with higher educational qualification are more likely to engage in non-farm activities than on-farm only, or combine non-farm activities with on-farm activities. This may be due to the fact that people with better level of education have better skills, experience, and knowledge which may help them to engage in diversified livelihood strategies. This corroborates the studies by Babatunde et al., (2010) , Dilruba and Roy(2012), and Gebrehiwot and Fekadu (2012); these researchers reported that education plays a significant role in a farmer's decision to increase income through off or non-farm activities as well as the contribution of rural families in diversifying the rural economy away from agriculture.

Furthermore, farmers with large farm size (X_5) were more likely to engage in on-farm plus non-farm activities than on-farm only as means of livelihood. This may be due to the fact that the farmers were not getting

sufficient yields from their farms, hence, the need to augment the shortfalls from their farms with returns from non-farm activities. This finding, however, is at variance with Ahmed, Bhandari, Gordoncillo, Quicoy, and Carnage (2018) who posited that households that had more land assets were less diversified in their income sources and probably more involved in farm activities.

Similarly, respondents with large household size (X_3) were more likely to combine farming activities with non-farm activities. This may not be unconnected with the fact that with increase in the number of household members to cater for, income from farm activities alone may not be able to cater for their needs. This, therefore, may prompt a household to engage in diversified livelihood strategies in order to meet the basic needs of the family. This is in line with Tegegne, (2000), and Demissie and Workneh's,(2004) findings that households with abundant labour supply are more likely to engage in livelihood diversification or have a higher participation in non-agricultural activities. Labour-rich households feel less constraint to send some of their members to non-farm activity. In addition, Asfir (2016), Mentamo and Geda (2016), and Tamerat (2016) also affirmed that family size was one of the factors positively affecting livelihood diversification. This is due to the presence of large families to practice multiple activities as household labourers to diversify their livelihood strategies.

It was also observed from the results that respondents with forests available in their areas are also more likely to diversify into non-farm activities as additional sources of livelihood due to limited farmland availability. Adugna, (2008) and Fikru, (2008) stated that farmers with smaller land size are involved in off-farm diversification activities because of shortage of lands to support their livelihood. These non-farm activities that are available to those with forests in their areas include collection of fuel wood for sale, gathering of leaves both for personal use and sales, lumbering, bush meat sales and sales of other non-timber forest products (NTFPs) obtained from the forests. It was further discovered that respondents with greater years of farming experience are more likely to combine both farming and non-farm activities as means of livelihood than engage in on-farm activity only. This may not be unconnected to their experience with their previous farm outputs which were probably unable to sufficiently take care of their livelihood needs.

Conclusion

Livelihood diversification activities are common among rural household. These could be on-farm only, non-farm only or non-farm plus on-farm activities combined. However, there are different factors that influence the choice of activities of each household. This study examined different income generating activities practiced by forest dwellers in Akwa Ibom and analysed the factors responsible for their choices. The study revealed that total household income, household size, farm size, educational qualification, access to extension services, farming experience and forest availability were the factors that significantly influenced the respondents' choice of livelihood strategies in the study area. Policies that will encourage diversification in order to broaden opportunities which will lead to increase in income and improve rural household livelihood should be encouraged.

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