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LIVELIHOOD STRATEGIES OF FARMING HOUSEHOLDS IN FOREST FRINGE COMMUNITIES OF NIGER STATE, NIGERIA

Felix Oakhena Idumah, Lucy Adeteju Orumwense, Femi Awe✉, Deborah Olubunmi Oke

Forestry Research Institute of Nigeria, Nigeria

Abstract. This study assesses the different types of livelihood strategies as well as factors that influence the choice of these strategies among rural households in Niger State, Nigeria. One hundred copies of a structured questionnaire were used to obtain information from respondents in the study area. Two Local Government Areas (LGAs) were purposively selected for the study. Both descriptive statistics such as frequencies and percentages and inferential statistics such as Multinomial Logistic Regression were used in the study. The average household size, farm size and farming experience in the study were 10, 2.2 acre and 20 years respectively and most of the respondents were educated. The results of the Multinomial Logistic Regression show that age, household size, farm size, non-farm income, access to extension services, educational qualifications, farming experience and forest availability in their locality were factors that influenced the respondents' choice of livelihood strategy relative to the reference category in the study.

Keywords: livelihood strategy, rural households, multinomial logistic regression, Niger State

INTRODUCTION

The concept of a livelihood strategy has become central to development practice in recent years. Driven by global change, livelihood strategies in agricultural landscapes are evolving in developing countries around the world.

Livelihood strategies include how people combine their income-generating activities, the way in which they use their assets, which assets they chose to invest in and how they preserve their existing assets and income. Nigeria's economy is mainly driven by agriculture and its resources, which support the expansion of all spheres of the economy; however, the farming households which are the bedrock of agricultural production happen to be the ones most affected by food insecurity and poverty (Kuwornu et al., 2013). Agricultural production involves risks, and farmers have to adapt or adjust their farming practices so as to avoid losses, since poor management of risks can result in crop failures leading to low production and an unstable income. To deal with this problem, diversification into the production of other crops and livestock by farmers has been recognized as a means to ensure a stable income (Ali, 2004). Diversification into non-farm activities is also increasing as a means of reducing poverty and income instability. Non-farm activities have the potential to help households reduce poverty by offering them a form of insurance against the risks of farming and minimizing their reliance on natural resources.

Diversification is a common survival strategy, especially among agricultural households, whose livelihoods are vulnerable to climatic uncertainties (Barrett et al., 2001). Livelihood diversification refers to the ways in which households raise income and reduce

✉Femi Awe, Forest Economics and Extension Services Department, Forestry Research Institute of Nigeria, Jericho Hills Ibadan, Oyo State, Nigeria, e-mail: femray4real@yahoo.com, <https://orcid.org/0000-0002-8244-9471>

environmental risks. It encompasses both on- and off-farm activities. These activities are carried out to create extra revenue to supplement agricultural activities (Sekumade and Osundare, 2014). In Nigeria, farming as a source of income has failed to meet the needs of many farm households (Babatunde, 2013). This is due to the subsistence nature of agriculture, declining farm sizes and low levels of produce turnout which characterize the agricultural sector in developing countries (Oku, 2011; Asiga, 2013). The agricultural sector in Nigeria is also characterized by severe drought, rainfall dependence, poor soil fertility and limited farm land (Gebu et al., 2018). Decisions on diversification can be seen as a coping strategy rather than alternative income opportunities (Ayantoye et al., 2017). Farm households pursue diverse non-farm livelihood activities to cope with various challenges and risks, such as drought (Alobo, 2015; Kassie and Aye, 2017). Deriving a share of their income from non-agricultural sources compensates for the dwindling income from agriculture and considerably improves the standard of living of rural dwellers (Ijaiya et al., 2011).

Several studies have been carried out to estimate the livelihood strategies adopted by the rural populace, especially farmers, in Nigeria. In their study on the determinants of livelihood diversification among farm households in Akamkpa LGA, Cross River State, Nigeria (Etuk et al., 2018) found that gender, marital status, poverty status, primary occupation and membership of associations were significant factors that influenced the livelihood diversification of the rural households in the study area.

Elsewhere, Ayantoye et al. (2017) did some work on the determinants of livelihood diversification among rural households in Kwara State, Nigeria. The study revealed that the factors that influence livelihood diversification among farm households were volume of credit received, household size, farm size and marital status.

Nwaogwugwu and Matthews-Njoku (2015) carried out a study on the social factors affecting the livelihood strategies of rural households in South-East Nigeria and their implications for rural development. The results indicated that the predominant agricultural livelihood strategies found among rural households in southeast Nigeria include crop farming and livestock farming while the predominant non-agricultural livelihood strategies include petty trading and remittances from relatives.

Unlike previous studies, the present study examines the livelihood strategies adopted by rural households as well as examining the determinants of livelihood

strategies among rural dwellers living in forest fringe areas in Niger State of Nigeria.

OBJECTIVES OF THE STUDY

The objectives of the study are to:

- i. assess the socioeconomic characteristics that influence the respondents' choice of livelihood strategy;
- ii. identify the various livelihood strategies within the study area;
- iii. examine the factors influencing the respondents' choice of livelihood strategy in the study area.

MATERIALS AND METHODS

Description of study area

The study was conducted in Niger State, Nigeria. Niger State is located between latitudes of 8°12' N and 11°20'22' N and longitudes of 4°30'2' E and 7°20'2' E. The State covers an estimated land area of 76,363 square kilometers and has a population of 4,082,558 people (NPC, 2006; Gana et al., 2009). The state is bordered to the North by Zamfara State, to the Northwest by Kebbi State, to the South by Kogi State and to the Southwest by Kwara State, while Kaduna State and the Federal Capital territory border the state to the Northeast and Southeast respectively. Furthermore, the state shares an international boundary with the Republic of Benin at Babanna in Borgu Local Government Area. The state is agrarian and well suited for the production of arable crops such as cassava, cowpea, yam, and maize because of favourable climatic conditions. The annual rainfall is between 1,100 mm and 1,600mm, with average monthly temperatures ranging from 23°C to 37°C (Gana et al., 2009). The type of vegetation is Guinea savanna.

Sampling techniques and method of data collection

A multi-stage sampling technique was used in the study. The first stage involved purposive selection of Gurara and Mokwa LGAs because they are predominantly noted for agriculture. They are communities where farming is the main occupation. The second stage involved the selection of five rural communities from each local government area, while the third stage involved the systematic random sampling of ten (10) rural farming households from each rural community, giving a total sample size of 100 farming households.

Analytical technique

The data collected were analyzed using descriptive statistics such as frequencies and percentages as well as inferential statistics such as multinomial logistic regression, which was used to identify the 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 regression model followed the examples of Budry et al. (2006), Bandara and Thiruchelvam (2008) and Rahji and Fakayode (2009) to express the probability of a farmer being in a particular category. The farmers were categorized into three groups based on the livelihood strategy chosen. The strategies included on-farm only (the reference category), non-farm only and both (combination of on-farm and non-farm).

The Multinomial Logit Model is a widely used technique in applications that analyze 'polytomous' response categories in different areas of economic and social studies. Lorato (2019) stated that the Multinomial Logit Model is an important model for examining the determinants of household livelihood strategy choices from a range of alternative livelihood strategies. Thus, to identify the determinants of smallholder farming rural households' decisions to adopt different livelihood strategies, Multinomial Logit Model was used. The assumption is that in a given period before the disposal of his asset endowment, a rational household head will choose from among the three mutually exclusive livelihood strategies that could offer the maximum utility.

The general form of the multinomial Logit model is:

$$\Pr(y_i = j) = \frac{\exp(X_i \beta_j)}{1 + \sum_{j=1}^J \exp(X_i \beta_j)} \quad (1)$$

And to ensure identifiability,

$$\Pr(y_i = 0) = \frac{1}{1 + \sum_{j=1}^J \exp(X_i \beta_j)} \quad (2)$$

where for the i th individual, y_i is the observed outcome and X_i is a vector of explanatory variables. β_i is the unknown parameters. The model for this study can be summarized as follows:

$$P_{ij} = \frac{\exp(y_j X_i)}{1 + \sum_{j=1}^3 \exp(y_j X_i)} \quad \text{for } j = 1, 2, 3. \quad (3)$$

P_{ij} is the probability of being in each of the groups 1 and 2.

$$P_{i0} = \frac{1}{1 + \sum_{j=1}^3 \exp(y_j X_i)} \quad \text{for } j = 0. \quad (4)$$

P_{i0} is the probability of being in the reference group or group 0.

In practice, when estimating the model, the coefficients of the reference group are normalized to zero (Maddala, 1990; Greene, 1993; Kimhi, 1994; Rahji and Fakayode, 2009). This is because the probabilities for all the choices must sum up to unity (Greene, 1993). Hence, for three choices only, (3 – 1) distinct sets of parameters can be identified and estimated. The natural logarithms of the odd ratio of equations (1) and (2) give the estimating equation (Greene, 1993) as:

$$\ln = \frac{(P_{ij})}{(P_{i0})} y_j X_i \quad (5)$$

This denotes the probabilities of each of the groups 1 and 2 relative to the probability of the reference group. The estimated coefficients for each choice therefore reflect the effects of X_i on the likelihood of the farmers choosing that alternative relative to the reference group. However, following Hill (1983) and Rahji and Fakayode (2009), the coefficients of the reference group may be recovered using the formula

$$y_3 = -(y_1 + y_2) \quad (6)$$

For each explanatory variable, the negative of the sum of its parameters for groups 1 and 2 is the parameter for the reference group.

Description of variables used in the 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 an on-farm strategy only, Y_2 = those who engaged in a non-farm strategy only and Y_3 = those that were involved in 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:

$$P_{ij} = \beta_0 \text{AGE} + \beta_1 \text{MS} + \beta_2 \text{HHS} + \beta_3 \text{FS} + \beta_4 \text{TMI} + \beta_5 \text{AES} + \beta_6 \text{EDUC} + \beta_7 \text{ATFC} + \beta_8 \text{MOA} + \beta_9 \text{FE} + \beta_{10} \text{FAIA} \quad (7)$$

where:

- Y – income-generating or livelihood strategies adopted by households
 $X_1(\text{AGE})$ – age of respondent (years)
 $X_2(\text{MS})$ – marital status (married=1, otherwise=0)
 $X_3(\text{HHS})$ – household size (numbers)
 $X_4(\text{FS})$ – farm size (hectares)
 $X_5(\text{NFI})$ – non-farm income (in Naira)
 $X_6(\text{AES})$ – access to extension services (access = 1, otherwise = 0)
 $X_7(\text{EDUC})$ – educational level of respondent (years)
 $X_8(\text{ATFC})$ – access to formal credit (access = 1, otherwise = 0)
 $X_9(\text{MOA})$ – membership of association (member = 1, otherwise = 0)
 $X_{10}(\text{FE})$ – farming experience (years)
 $X_{11}(\text{FAIA})$ – forest availability in area (availability = 1, otherwise = 0)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The socio-economic characteristics of the respondents are presented in Table 1. The study revealed that a large proportion of the household heads were male and were married. This is in line with the results of Nmadu et al., 2014, who opined that most male-dominated household headship is a sign of respect and responsibility to self and family. The result also corroborates findings by Okere and Shittu (2012), which revealed that males dominated the workforce in Nigeria's agricultural communities. The results further revealed that the mean farm size was 2.2 acres, implying that most of the respondents are subsistence-oriented farmers and income diversification will likely help raise their standard of living above the poverty level. Furthermore, the respondents had an average of 20 years of farming experience. This shows that the farmers were experienced in farming activities and were probably aware of the best strategy to adopt in order to improve their income. This agrees with the findings of Sallawu et al. (2016), who affirmed that household heads with vast farming experience would probably participate less in non-farm activities due to their high level of

Table 1. Socio-economic characteristics of respondents

Characteristics	Frequency	Percent
Gender		
Female	14	14
Male	86	86
Age category		
≤30	14	14
31–40	14	14
41–50	6	6
51–60	25	25
>60	41	41
Marital status		
Single	12	12
Married	87	87
Widowed	1	1
Household size group		
1–5	15	15
6–10	19	19
11–15	22	22
>15	44	44
Educational qualification		
No formal education	9	9
Primary education	27	27
Secondary education	39	39
Tertiary education	25	25
Occupation/livelihood strategy		
On-farm only	21	21
Non-farm only	13	13
Both on-farm and non-farm	66	66
Farm size (acre)		
1–2	66	75.9
3–4	11	12.6
>4	10	11.5
Farming experience		
1–5	4	4.6
6–10	4	4.6
11–15	10	11.5
>15	69	79.3
Total income/month (N)		
<20,000	6	6
20,001–40,000	16	16
40,001–60,000	8	8
60,001–80,000	3	3
80,001–100,000	30	30
>100,000	37	37

experience. The results further revealed that a large proportion (37%) of the farmers had a total income above N100,000.

The majority of the respondents (41%) were more than 60 years old. This implies that the respondents were no longer of an active age. This possibly explains why the respondents needed to diversify from farming into other activities. It can also be inferred that the young men in their families may no longer be interested in farming and may have migrated to urban areas. The results revealed that a substantial percentage (44%) of the farmers had a family of more than 15 persons with an approximate mean of 10 persons per household. This implies that household sizes are relatively large, corroborating the findings of Sallawu et al. (2016) and Okere and Shittu (2012), who affirmed that larger households may have to depend on more income-generating activities for a sustainable livelihood than smaller households. In addition, 39% had a secondary education, 25% had a tertiary education, and 27% had a primary education. This shows that most of the respondents were educated, agreeing with the findings of Etuk et al. (2018), who affirm that the level of education influences the kind of opportunities available to improve livelihood strategies, enhance food security, and reduce poverty.

Livelihood diversification strategies of the respondents

Fig. 1 below shows that 21%, 13% and 66% of the sample households were able to diversify into on-farm only, non-farm only and on-farm + non-farm income-generating livelihood strategies respectively. This implies that most of the respondents combine farming with non-farm activities, some allocate all of their labour to agricultural activities only, and others rely solely on non-farm activities.

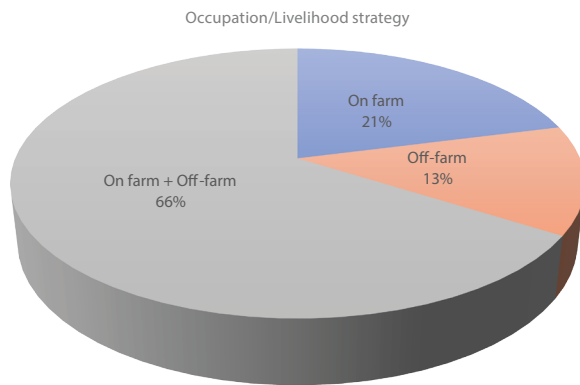


Fig. 1. Occupation/livelihood strategy

Membership of associations, source of capital and extension services

Table 2 displays information on membership of associations, source of capital and access to extension services. From the results, 51% of the respondents belong to an association and the majority (41%) belong to a farmers' association. From the results it was identified that the benefits derived from membership of associations include loans (79.6%) and inputs (20.4%). In addition, membership of associations offers farmers access to training, information, and communal agricultural equipment (Azizi and Zamani, 2009). A large proportion (69%) of the farmers reported that their source of income was their personal savings while the majority (89%) lacked access to extension services.

Table 2. Information on membership of associations, source of capital and extension services

	Frequency	Percentage
Membership of Association		
Yes	49	49
No	51	51
Type of association		
Farmers association	41	83.7
Artisan association	2	4.1
Traders association	6	12.2
Benefits derived from association		
Loans	39	79.6
Inputs	10	20.4
Source of capital		
Personal savings	69	69
Loan from friends	7	7
Loan from bank	3	3
Loan from government	3	3
Loan from cooperatives	18	18
Access to extension services		
Yes	11	11
No	89	89

Forest utilization / harvesting of forest resources

Table 3 features information on forest utilization by the respondents. From the results, the majority (86%) affirmed forest availability in the area. Most (83%) collected non-timber forest products (NTFPs) from the

forest for sale (64%) and most (about 52%) of the income from sales of these forest products was between N1,001 and N5,000 per capita. This implies that the respondents are able to earn a living from the forest. The table further reveals the frequency of visits to the forest, with the majority (53.6%) visiting weekly to harvest products.

Table 3. Information on forest utilization

	Frequency	Percentage
Forest Availability in the area		
Yes	86	86
No	14	14
Collection of item in the forest		
Yes	83	83
No	17	17
Frequency of visit to the forest		
Daily	3	3.7
Weekly	44	53.6
Bi-weekly	9	11.0
Monthly	26	31.7
Purpose of collection		
Personal use	3	3.7
Family use	15	18.3
Sales	64	78.0
Income from sales of forest products		
<1,000	4	6.7
1,001–5,000	31	51.7
5,001–10, 000	17	28.3
>10,000	8	13.3

Determinants of the choice of livelihood strategy

The results of the multinomial logit analysis show the factors that influence the choice of livelihood strategy by rural households in Niger State, as shown in Table 4. The effect coefficients were estimated with respect to the on-farm only livelihood strategy, serving as the reference category. Therefore, the inference of the estimated coefficients for each choice category was made with reference to the on-farm only livelihood strategy. The table shows that the likelihood ratio (χ^2) value was 18.092 and this is significant at the 1% level of probability. This confirms that all the slope coefficients are significantly different from zero. The pseudo R^2 value

of 0.6302 also confirms that all the slope coefficients are not equal to zero. In other words, the explanatory variables are collectively significant in explaining the factors that influence the choice of livelihood strategy by rural households in the study area. Hence, the pseudo R^2 value in this study is indicative of good fit and the correctness of the estimated model. The marginal effects or odds ratio (relative risk ratio) measures the expected change in probability of a particular choice being made with respect to a unit change in an independent variable (Green, 2003).

The results in Table 4 show that out of the ten independent variables hypothesized, six were found to significantly influence respondents' choice of non-farm only livelihood strategy while eight of the variables statistically influenced their choice of the on-farm + non-farm livelihood strategy. The results indicates that age, marital status, farm size, access to extension services, education and access to formal credit were factors that influenced the respondents' choice of non-farm only as a livelihood strategy relative to the reference category (on-farm only) in the study area. This implies that as respondents grew older, the likelihood of engaging in non-farm only as a form of livelihood strategy is about seven times higher than that of engaging in on-farm only. This may be connected with the tedious nature of farming, and since older people may not have enough strength to engage in active farming, they tend towards non-farm activities. However, respondents who had access to extension services and had large farms decided to choose the on-farm only strategy over the non-farm only livelihood strategy. This could possibly be due to the fact that during their meetings with extension agents, they were provided with the inputs and technology needed to facilitate their farming activities. Likewise, respondents who had access to formal credit and were married preferred to engage in non-farm only rather than on-farm only activities.

Furthermore, the results indicated that age, household size, farm size, non-farm income, access to extension services, education and farming experience, as well as the availability of forest in the respondents' area, positively and significantly influenced their choice of non-farm and on-farm livelihood strategies over on-farm only in the study area. This indicates that as respondents advanced in age, they were more likely to engage in both on-farm and non-farm activities than on-farm only. This corroborates the findings of Debele and Desta (2016), who affirmed that the age of the household head

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

Variables	Non-farm only			Non-farm + on farm		
	coeff.	odd ratio	P-value	coeff.	odd ratio	P-value
AGE	2.003	7.411	0.041*	0.608	8.231	0.002*
MS	0.221	1.247	0.025*	2.108	0.853	0.577
HHS	−0.058	0.943	0.813	−0.158	7.530	0.007*
FS	0.033	0.034	0.027*	2.019	2.093	0.005*
NFI	1.211	3.356	0.942	0.739	3.672	0.007*
AES	−1.918	0.147	0.002*	1.301	0.291	0.021*
EDUC	1.367	3.924	0.019*	−1.234	2.939	0.015*
ATFC	0.194	1.214	0.003*	1.078	0.766	0.814
MOA	0.300	1.349	0.804	−0.267	1.027	0.934
FE	−0.239	0.788	0.667	0.027	2.798	0.005*
FAIA	−13.931	8.91E-7	0.989	1.037	2.820	0.012*

Model chi-square = 18.092; $p < 0.0001$, $-2 \log \text{likelihood} = 299.775$, Pseudo $R^2 = 0.6302$.

The reference category is: on-farm only.

*Significant at 1%.

had a positive effect on livelihood diversification strategies because experience increases with age and helps in the decision to diversify livelihood strategies.

This finding further indicates that respondents with large household size are about eight times more likely to choose both non-farm and on-farm strategies than engaging in farming activities only. Household size has been identified as one of the factors positively affecting livelihood diversification (Adepoju and Obayelu, 2013; Melese et al., 2018). This is due to the presence of a large number of family members to practice multiple activities and to diversify livelihood strategies (Wondim, 2019).

The results also indicate that farmers with large farms are more likely to engage in a combination of on-farm and non-farm activities so as to be able to generate the financial resources needed to manage a large farm, e.g., hiring of labour and purchase of other farm inputs.

The results further show that respondents who earned income from non-farm activities are about four times more likely to combine non-farm activities with farming than farmers who engaged in on-farm activities only. This is in line with the findings of Wondim (2019) that households with a large cash income were

more likely to diversify into non/off farm activities. The possible reason is that those farmers who have adequate income sources can overcome financial constraints by engaging in alternative income-generating activities (Yizengaw et al., 2015; Asfir, 2016).

Furthermore, respondents who have access to extension services are less likely to engage in non-farm activities as well as combined on-farm and non-farm livelihood strategies. This may be due to the fact that farmers with better extension contacts have better access to agricultural information and technical assistance with agricultural activities to increase production and productivity (Asfir, 2016).

Educational level has a positive and significant relationship with households' choice of combined on-farm+non-farm livelihood strategies when compared with on-farm only. Therefore, respondents with higher educational qualifications are more likely to engage in a combination of non-farm and on-farm activities since they may have better skills, experience and knowledge (Debele and Desta, 2016). These findings are consistent with those obtained by Eshetu and Mekonnen (2016).

Farming experience has a positive effect on the choice of a combined on-farm and non-farm livelihood strategy.

Interpretation of the odds-ratio showed that if other factors are held constant, the likelihood of respondents engaging in combined on-farm and non-farm livelihood strategies is about three times higher than the likelihood that they will engage in on-farm only. The possible explanation for this could be that where the income from farming is unable to meet a farmer's financial requirements, he might look for other means to augment it.

The multinomial logit result also demonstrated that respondents who have access to a forest in their area adopt a combination of on-farm and non-farm activities as a livelihood strategy. The non-farm activities that are available to those who are located close to forests include the collection of fuel wood, the gathering of leaves, the production of lumber, the hunting of animals and the harvesting of other non-timber forest products (NTFPs) which are either consumed or sold to earn more income.

CONCLUSION

The study revealed that respondents in the study area engaged in different livelihood strategies that included 'on-farm only', 'non-farm-only' and a combination of on-farm and non-farm livelihood strategies. It was discovered that most of the respondents were married with an average household size of 10 members. Most of the respondents were found to have small land holdings of less than three acres. The results of the multinomial logit analysis showed that the socioeconomic attributes of the respondents played a significant role in influencing their choice of livelihood strategy.

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