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SOCIO-ECONOMIC FACTORS INFLUENCING LIVELIHOOD DIVERSIFICATION AMONG RURAL FARMING HOUSEHOLDS IN SOUTHWEST NIGERIA: A FRACTIONAL RESPONSE MODEL APPROACH

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Abstract

The socioeconomic factors influencing livelihood diversification among rural farming households was explored in this study. To choose 300 respondents for the study, a multistage sampling technique was used. A well-structured questionnaire was used to collect data on rural farming household's socio-economic characteristics, livelihood activities engaged in by farming households. Descriptive statistics, Simpson Index of Diversification and Fractional response model were used to examine the data. The result revealed that rural farming households were majorly headed by males who were in their late middle ages, with large household size. The study also revealed that sex of the household heads, marital status, household size, educational level, farm size, farming experience and amount of credit obtained were significant socio-economic factors influencing livelihood diversification among rural farming households. The study recommends that increased efforts should be made to make credit accessible to rural farming households. This will encourage diversification into various livelihood activities, leading to increased productivity and income.

Key words**:** *livelihood diversification, rural farming households, Fractional Response model*

INTRODUCTION

Innovation in rural areas involves both livelihood diversification of the households [12] and also the implementation of a new concept regarding the development of the local communities [14]. Rural farming household's main source of livelihood is farming, which is subsistent in nature. They cultivate on small expanse of farm land of less than two-hectares in size [3, 6, 10]. Their farming activities provide for the household food and other basic needs while the meager marketable surpluses are traded to earn income [18]. Rural farming households gets their income from farm income which is equated as agricultural income and is not sufficient to meet their basic needs. Rural farming households do not get optimum economic returns on their produce due to various factors ranging from inadequate storage facilities, lack of good processing techniques, poor road networks [9]. In order to reduce their dependence on farming activities alone, rural farming households are beginning to diversify their means of livelihood. Livelihood diversification helps rural households to make use of their idle labour hours particularly in the slack period of farming activities [1]. The income generated through such activities are then used for family sustenance in the case of economic challenges or invested in farm enterprises among rural farming households [5]. Livelihood diversification which encompasses economic activities associated with different crop production, livestock husbandry, off-farm and non-farm enterprises have been seen as sources of succor by rural farming households. They range from planting different varieties of crops, raising of animals, diversifying from low-value crops to high

value crops and engagement in artisanal to other off-farm activities [17, 21]. Income from livelihood diversification is important to the rural poor as farm income obtained by poorer households is not enough to meet family needs. Since smallholder farming activities are seasonal in nature, farming households take livelihood diversification as income supplements as well as critical source of liquidity for those who are credit constrained. It also provides resources needed for investment in advanced agricultural technologies that could lead to increased agricultural productivity [4]. Livelihood diversification also helps rural farming households to absorb farm income shocks and improve income distribution [24]. Several studies [16, 22, 25] on livelihood diversification have been conducted among rural farming households, and has shown that rural farming household diversify. Although, literature on socio-economic factors influencing livelihood diversification among rural farming households in Southwest, Nigeria are still scanty. Also, the participations of rural farming households in various livelihood activities as well as the contribution of off-farm livelihood activities to total household is still small compared to farm income. There is a need to identify the socio-economic factors influencing livelihood diversification. Consequently, the study investigated the socio-economic factors influencing livelihood diversification among rural farming households in the study area. Specifically, the study describes the socioeconomic characteristics of rural farming households in the study area; identifies the livelihood sources among rural farming households in the study area; determines the level of diversification among rural farming households in the study area; and determines the socio-economic factors affecting livelihood diversification among rural farming households in the study area.

MATERIALS AND METHODS

Study Area

The study was carried out in Southwest, Nigeria, which comprises of six states (Ekiti, Lagos, Osun, Oyo, Ondo and Ogun). The study area in the North, shares boundaries with Kogi and Kwara States, to the East with Edo and Delta States, in the Western side by the Republic of Benin and to the South by the Gulf of Guinea. The zone has a total land area of 77,818 km^2 and an estimated population of 38,257,260 [15]. The climate of southwest Nigeria is tropical in nature and is characterized by wet and dry seasons. The temperature ranges between 21^oC and 34^oC while the annual rainfall ranges between 1,500mm and 3,000mm. The climatic condition encourages the cultivation of early and/or late crops such as cassava, yam, millet, rice, plantains, cocoa, palm produce, cashew and maize. The major occupation of people in this geopolitical zone include farming, trading, hair dressing, carpentry, marketing as well as food processing [17].

Sampling Procedure and Sample size

Multistage sampling technique was employed for this study. The first stage involved random selection of two States Oyo and Ondo out of the six states in the southwest region of Nigeria. Based on proportionate sampling, four and two Local Government Areas (LGAs) were randomly selected from Oyo and Ondo States respectively. From each of the resulting six LGAs, five villages were further randomly selected at the third stage, giving a total of thirty villages. The last stage involved a random selection of ten farming households from each village. In all a total of three hundred farming household were selected for the study. The sample size was a proportion of the population at 5% level of significance and 6% margin of error following Cochran method of sample determination.

Method of Data Collection

Primary data were employed for this study. Data were collected with the aid of well-structured questionnaire. Data were collected on rural farming household's socio-economic characteristics such as age, years of experience, educational status, household size, marital status, farm size of the household heads, membership of cooperative societies, access to credit. Data were collected on the number of livelihood activities engaged in by farming households.

Analytical techniques

Descriptive statistics simpson index of diversification, fractional response model were used to analyse the data collected.

Descriptive Statistics

Descriptive statistics such as frequency tables, percentages and means were used to describe the socio-economic characteristics of rural farming households and identify different livelihood sources that exist in the study area.

Simpson Index of Diversification

The level of livelihood diversification was determined using Simpson index of diversification. Simpson index of diversification was used because of its computational simplicity, robustness and wider applicability. It is specified as:

$$SID=1-\sum_{i=1}^{n} Pi^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where:
SID= Simpson index (measure of livelihood diversification)
n =total number of income sources
Pi= income proportion of ith income source.

Pi is specified as:

$$Pi=\left(\frac{mi}{mt}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where:
m_i = income from each activity
m_t = household's total income from all activities.
Based on the values of SID, level of livelihood diversification was specified as:
1. No diversification (SID < = 0.01)
2. Diversification level is low, when (SID = 0.01 - 0.25)
3. Diversification is at medium level, when (SID = 0.26 - 0.50)
4. Diversification is at high level, when (SID = 0.51 - 0.75)
5. Diversification level is very high, when (SID > 0.75)

Fractional response model

A fractional response model was employed to evaluate socio-economic factors influencing livelihood diversification (objective 4) in the study area. This in line with [11] In the model, livelihood diversification index is the dependent variable. Fractional response model is more suitable because the level of livelihood diversification is a fraction variable bounded between 0 and 1. And the fractional variables are not censored.
The fractional response model is defined as:

$$E(Y/X)=G(X\beta) \quad \ldots\ldots\ldots (3)$$

The model is implicitly defined as:

$$E(SID/X)=Xb+\varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots..(4)$$

where:
SID = the dependent variable as defined above,
X= matrix of independent variables
b = vector of parameters to be estimated
e = error term.
Fractional response model is used to estimate the *b* vector of the model because the dependent variable is a fraction which is confined to zero and one.
The model was explicitly specified as:

$$E(SID/X)=E(Y)=\beta_0+\beta_1 X_1+\beta_2 X_2+\beta_3 X_3+\beta_4 X_4+\beta_5 X_5+\beta_6 X_6+\beta_7 X_7+\beta_8 X_8+\beta_9 X_9+\beta_{10}X_{10}+e \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Thus, the explanatory variables used in the analysis are:
Y* = livelihood diversification index [as derived from (4)]
$X_{1=}$ age (Years)
X_2= sex (Male = 1, Female =0)
X_3= marital status (1=Married, 0=otherwise)
X_4= level of education (years)
X_5= household size (number of persons)
X_6 = Farming experience (years)
X_7= membership of association (expressed as a dummy; if yes1, if otherwise 0)
X_8= farm size (hectares)
X_9= extension visits (number)
X_{10} = credit (amount in naira)
e=Random error

RESULTS AND DISCUSSIONS

Socioeconomic Characteristics of the rural households

Table 1 shows that majority (85.0%) of the rural household were headed by males while

15.0% were headed by females. This could be because farming activities in rural areas are mostly carried out by males who mostly have title to land and are the breadwinners of most homes, while the female counterpart were involved in processing and marketing of agricultural products. This enhances diversification of livelihood in the rural setting to cater for the welfare of the household. The age distribution of the respondents revealed that majority of the farmers (42.0%) were aged between 41-50 years with a mean age 51.3±8.14 years. This implies that majority of the household heads were in their late middle ages but still productive to engage in agricultural production and explore various livelihood opportunities. The finding is in agreement with that of [2] who stated that participants in farming activities were energetic and economically active to engage in farming and other livelihood activities. The result further revealed that majority (87.0%) of the respondents were married, 63.3% of the respondents had a household size that ranged from 5-8 members, with an average household size of 7.16±2.34 members. From the result, the household size is fairly large suggesting that there may be availability of family labour for their occupations, but will incure high family expenses hence households with large members need to depend more on various income generating activities to meet family needs. This confirms the view that large family size has better chance of livelihood diversification than households with small size [8, 23].

The level of education among the respondents was fairly low as nearly 63.4% of the respondents had less than secondary education, 9.0% completed tertiary education while 27.7% had no formal education. The low level of education among rural farming households head, might have serious implications on their earning capacity as they may lack skills to secure well-paid jobs, thereby affecting the poverty status of the respondents. This assertion is in line with the findings of [23], who stated that low literacy level among farming households will make it difficult for farming households to adopt modern improved techniques on how to increase their income.

While Majority of the respondents (82.7%) engaged in farming as their primary occupation, the remaining 17.3% were into farming as secondary occupation as they engaged in other livelihood activities like artisans, trading, civil service. This shows that farming is the predominant source of income among rural households. This is in line with the findings of [20] who posited that farming is the main occupation among farming households in rural areas. The result revealed that 75.7% had between one and five hectares of farm land while 16.8% of the households had more than six hectares of farm land. The mean farm size owned was 3.29±2.99. Although the mean farm size is small. This shows that rural farming households practice farming on a small scale, which affect their income, thereby leading to households diversifying into other sources of income to cater for family needs. From the result, about 59.7% of the respondents were members of farmer's associations or cooperative societies while 40.3% of the respondents were not. The result showed that more than two-third (79.0%) of the respondents had no access to credit, while only 21.0% had access to credit. This implies that there was limited access to credit among the respondents which may reduce the opportunities of diversifying into various livelihood opportunities. The result also revealed that majority (32.3%) of the respondents have never been visited by any extension agent while 32.0 % of the respondents were visited twice. Thus, rural farming households would have limited relevant information on farm business to increase their output and hence their income. This confirms the view that majority of the households had no access to innovations that would increase their agricultural output in order to increase their income [23]. The result also showed that majority (31.3%) of the household earned between ₦500,000-₦749,999 while 24.3% of the households earned income between ₦250,000 - ₦499,999. The mean household annual income of the respondents was ₦58,0145±₦40,1142.1.

Table 1. Socio-economic characteristics of respondents

Characteristics	Frequency	Percentage
Gender		
Male	255	85.0
Female	45	15.0
Total	300	100.0
Age (Years)		
≤30.0	3	1.0
31-40.0	34	11.3
41-50.0	126	42.0
51-60.0	106	35.3
61.70.0	27	9.0
>70.0	4	1.3
Total	300	100.0
Marital status		
Single		
Married	4	6.7
Divorced	261	87.8
Widowed	15	1.1
Total	20	2.8
	300	100
Level of education (years)		
No formal education	83	27.7
Adult education	2	0.7
Primary school	97	32.3
Secondary school	91	30.3
Tertiary school	27	9
Total	300	100
Main occupation		
Farming	248	82
Trading	22	8.0
Artisan	18	6.0
Civil servant	12	4.0
Total	300	100
Household size		
1-4	28	9.3
5-8	134	44.7
9-12	121	40.3
≥13	17	5.7
Total	300	100.0
Farm size (Hectares)		
≤ 1.0	22	7.30
1.1-5.0	227	75.7
5.1-10.0	46	15.3
>10.0	5	1.70
Total	300	100
Membership of cooperative/ association		
Yes	179	59.7
No	121	40.3
Total	300	100
Access to formal Credit		
Yes	63	21.0
No	237	79.0
Total	300	100
Number of Extension agents visit within a year		
No visitation	106	35.3
Once	17	5.7
Twice	96	32.0
More than twice	81	27.0
Total	300	100
Household Annual Income (₦)		
<₦250,000	54	18.0
₦250,000 - ₦499,999	73	24.4
₦500,000 - ₦749,999	94	31.3
₦750,000 - ₦999,999	64	21.3
≥₦1,000,000	15	5.0
Total	300	100

Source: Field Survey, 2021.

Livelihood sources among rural farming households in the study area

Livelihood sources available among rural farming households is presented in Table 2. The table shows household participation in different livelihood sources as well as the share of income from these sources. Household participation in different livelihood activities was calculated by dividing the number of respondents that engaged in a particular livelihood activity by the total number of respondents and then multiply by 100. The income share among rural farming household was calculated, by dividing the total income generated from all the respondents that participated in a particular livelihood activity by the total income of all the sampled respondents, and then multiply by 100. The result showed that all the farming households (100%) derived income from farming activities which accounted for 26.0% of the total income. Other livelihood activities identified among rural farming households in the study area are agricultural labour, hunting, grinding, food vending, food processing, trading, artisans (Tailors, hairdressers, welders, mechanics, carpenters, electricians, bricklayers), civil servant, private workers and transportation business. 35.0% of the respondent participated in trading with total income share of 6.9%, 27.7% of the respondent participated in artisanship with

total income share of 5.9%, 6.3% of the respondents engaged in transportation as a means of livelihood with a total income share of 9.0%, 5.0% of the respondents were civil servant with a total income share of 15.6%, while about 1.3% of the respondents engaged in the processing of agricultural produce with a total income share of 3.6%.

Table 2. Livelihood sources among rural farming households

Livelihood activities	Frequency	Participation (%)	Share of income (%)
Farming	300	100	26.0
Agricultural Labour (wage)	10	3.3	5.5
Hunting	9	3.0	6.1
Trading	107	35.7	6.9
Grinding	6	2.0	5.3
Food Vending	11	3.7	6.8
Agricultural Processing	4	1.3	3.6
Artisan	83	27.7	5.9
Civil servant	15	5.0	15.6
Private workers	5	1.7	9.3
Transportation business	19	6.3	9.0
Total	569	189.7	100

Source: Field Survey, 2021.
*****Multiple response due to multiple jobs by some of the respondents

This implies that aside farming, majority of the farming households engage in off-farm and non-farm activities to increase their earnings. This is in line with the findings of [23] who found out that farming households engage in farming and other non-farming activities such as agricultural trading, forest production, agricultural processing, artisans, construction works and transportation business.

Level of livelihood diversification

Table 3 shows the level of diversification among rural farming household, livelihood diversification was determined using Simpson Index of Diversification (SID). The result revealed that 10.3% of the households did not diversify, 8.0% of the households have poor diversification level while 50.0% of the households diversified at a medium level of diversification. Although on the contrary 31.7% of them diversified their income sources at a high level. Consequently, the overall mean value of Simpson diversification is 0.4, which indicates a medium level of diversification across all farming households in the study area.

Table 3. Distribution of household per level of livelihood diversification

Simpson index range	Frequency	(%)	Level of diversification
<= 0.01	31	10.3	No Diversification
0.02-0.25	24	8.0	Low
0.26-0.50	150	50.0	Medium
0.51-0.75	95	31.7	High
Total	300	100.0	
Mean	0.41		
Stand. Deviation	0.19		
Minimum	0.00		
Maximum	0.75		

Source: Field survey, 2021.

Socio-economic factors influencing livelihood diversification among rural farming households

Fractional response model was used to determine the socioeconomic factors influencing livelihood diversification as presented in Table 4. Firstly, in the estimated model, the variance inflation factor (VIF) of the variables were computed to check the presence or absence of multicollinearity. The result indicated that none of the variables had a VIF value up to 10. The general thumb rule state that the VIFs exceeding 10 are signs of serious multicollinearity which require corrections. The mean VIF values of all explanatory variables was 2.27 which is less than 10, indicating that multicollinearity was not a problem. The socioeconomic factors influencing livelihood diversification of respondents is shown by the results of the Fractional response model as presented in Table 3. The value of wald chi-square which was statistically significant at 10% with log pseudo-likelihood of -202.1181 confirmed the goodness of fit of the model. The result shows that seven of the explanatory variables, age of respondents (X_1), sex of respondents (X_2), household size (X_5), farming experience (X_6), membership of association (X_7), farm size (X_8) and extension visit (X_9) were positively

related to level of diversification. The other three variables: marital status (X_3), educational level (X_4) and amount of credit (X_{10}) were negatively related to level of diversification. The result shows that five out of the ten explanatory variables were statistically significant at acceptable levels. In other words, sex of the household heads (X_1), education of the household heads (X_4), household size (X_5), farm size (X_8), and credit amount (X_{10}) were the significant socio-economic factors which influenced livelihood diversification among rural farming households in the study area.

The coefficient of the sex of household head was positive and significantly influenced livelihood diversification at 10% probability level. As shown, a unit increase in male headed households increases the chance of livelihood diversification by 5.33%. This is in conformity with *a priori* expectation, because male headed households are the breadwinners of most homes and have more responsibilities to fulfil than their female counterpart which influences livelihood diversification. This is in line with the findings of [21] indicating that male headed households engage in more income generating activities than their female counterpart. The coefficient of household size was positive and significant at 5%. As shown, a unit increase in the member of a household would increase the level of livelihood diversification by 1.03%. This is in line with *a priori* expectation because households with large household sizes will be influenced to access various income earning opportunities to meet household needs and thereby reduce household poverty. The result agrees with the findings of [13] who reported that household size had a positive impact on livelihood diversification because the availability of more labour power among farming household members encouraged them to participate in various livelihood activities.

Table 4. Fractional response model of Socio-economic factors influencing livelihood diversification

Variables	**Coefficient**	**P-value**	**Marginal effects**	**VIF**
Age	0.0039 (0.0048)	0.409	0.0015	2.33
Sex	0.1369 (0.09)	0.146*	0.0533	2.22
Marital status	-0.0851 (0.07)	0.206	0.0301	2.29
Education	-0.0101 (0.0056)	0.071*	-0.0039	1.19
Household size	0.0266 (0.013)	0.036**	0.0103	1.29
Farming experience	0.0066	0.331	0.00254	2.40
Membership of an association	0.0591 (0.0062)	0.347	0.0226	1.15
Farm size	0.0831 (0.04)	0.025**	0.0151	4.28
Extension visit	0.0027 (0.02)	0.868	0.0062	1.22
Credit amount	-5.99e-07 (3.25e-07)	0.065**	1.31e -07	4.35
Constant	-0.5129 (0.23)	0.026**	0.0301	2.27
/sigma	282.3231			
Number of observation	300			
Log pseudo-likelihood	-202.1181			
Wald chi (10)	16.90			
Prob> chi 2	0.0765			

Source: Data Analysis, 2021.
** Significant at 5% *Significant at 10%
* Standard error in parenthesis ()

Also, the coefficient of farm size was positively significant at 5%. The result implies that, a unit increase in the number of hectares of farm land cultivated by farming households would increase the level of livelihood diversification by 1.51%. This could be because they can either process the resulting increase in farm products or they will earn higher income, which they can subsequently invest in other enterprises. On the other hand, coefficient of years of formal education of the household head had negative sign and was statistically significant at 10%. The result of the marginal analysis implies that a unit increase in the number of years of formal education of household heads would decrease the need to diversify into other livelihood activities by 0.39%. The probable reason is that education provides necessary skills and abilities to get a permanent job which leaves them with less idle time and then leads an individual to get income from one source. The result is in conformity with the findings of [7], that educated persons get income from a single source. Also, amount of credit received by farming household was found to be statistically significant at 5% and negatively influence livelihood diversification. As shown, a unit increase in the amount of credit received by farming households decreases the level of livelihood diversification by 1.31e-05. This implies that households who have access to credit are less likely to diversify into other means of livelihood activities. Probable reason for this is that amount of credit obtained might be too little to diversify to other livelihood activities, however, this is contrary to *a priori* expectation. The result is also contrary to [7] which found out that the amount of credit obtained significantly and positively influenced livelihood diversification because credit helps the household to invest in both farm and non-farm activities.

CONCLUSIONS

The study investigated the socioeconomic factors influencing livelihood diversification. The study concluded that farming is the main livelihood activities that rural farming households engages in. Sex, household size, educational level, farm size and amount of credit obtained were significant socioeconomic factors influencing livelihood diversification among rural farming households in the study area Therefore, the study recommended that farming households should be encouraged to increase their production, by exposing them to improved farming techniques that can aid increase productivity by the extension agent, also increased efforts should be made to make credit accessible to rural farmers. This will encourage diversification into various livelihood activities, which will lead to increased productivity and income.

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