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## Empirical Analysis of Rural Livelihoods' Choices among Farming Households in Southwestern Nigeria

**Yaqoob Abdul Majeed**

Deputy Director, Department of Agriculture, Natural Resource, and Rural Development,  
Oyo State Local Government Service Commission, Nigeria

**Muhammad Abdul-Yakeen Rahji**

Professor, Department of Agricultural Economics, University of Ibadan, Nigeria

### **Abstract:**

*This study analyzed rural livelihoods with a view to investigating factors determining the choice of rural livelihoods in Southwestern Nigeria. A five-stage sampling procedure was used to select 400 farming households from Osun and Ekiti state. The collected primary data were analyzed using descriptive statistics, Chi-square statistics, income portfolio analysis, and a multinomial logit model. The results show that the age of household heads was  $51.9 \pm 11.4$  years, while the household size was  $8 \pm 2.9$  persons. On\_farm (3.6%), On\_farm-Off\_farm (17.8%), On\_farm-Non\_farm (19.7%) and On\_farm-Off\_farm-Non\_farm (58.9%) were the choices of livelihoods pursued. Improved socio-economic factors, including farm size (17.79\*), education (12.11\*), and access to credit (7.97\*), were found to be associated with the choice of on-farm livelihoods. Farm size increased the probability of specializing in on-farm livelihoods. Therefore, the land use act should be reviewed in such a way as to provide inclusive access to land for would-be farmers.*

**Keywords:** Farming households, Multinomial logit model, On-farm, rural livelihoods

### **1. Introduction**

About three-quarters of the population in developing countries engage in agriculture as the primary source of occupation (FAO *et al.*, 2015). However, poverty and hunger are widespread, particularly in the rural areas of developing countries where family farming and smallholder agriculture, including animal husbandry, fishing, and non-farm participation, are the common livelihoods. Rural livelihoods comprise mainly agriculture, with a segment of the population diversifying into non-farm activities in order to pursue their livelihood goals (Davies *et al.*, 2010). Agricultural activities involve many decisions, including what to grow, which inputs to apply and how, when to engage in land preparation, to seed, to harvest; how much to keep for consumption in the household, and how much to take to the market to mobilize financial resources, or how much to store. These decisions or risks are taken in an economic environment with inefficient market functioning and are also subject to adverse weather and price fluctuation (FAO, 2015). Consequently, these conditions affect the choice of livelihoods or a combination of livelihood activities pursued by farming households.

Available evidence shows that farming activities, on average, account for only 40-60% of the livelihoods pursued in South Asia and sub-Saharan Africa (Hilson, 2016). This is because earnings from farming activities have come under pressure due to population pressure, land degradation, and a high level of subsistence (Khartum & Roy, 2016). In addition, rural agriculture is often faced with myriads of problems, including depleting soil fertility, poor infrastructure, weather, and climatic vulnerability, thus forcing the majority of the rural households in Nigeria to deploy strategies such as agricultural intensification, livelihood diversification, and migration in attempts to secure their livelihoods (Jemal & Kim, 2014). While agricultural intensification and migration constitute some components of rural livelihoods, livelihood diversification is a broad component of rural livelihoods existing at varying levels of the rural economy. Therefore, it could be viewed as an adaptation technique or risk management for agrarian households.

Livelihood diversification can be referred to as a continuous system of preserving and evolving a broad range of activities and enterprises to reduce the variability that is often associated with farm income, minimize the effects of seasonality, and offer alternative income sources or supplementary earnings (Loisson, 2016). Agricultural or non-agricultural livelihood diversification by farming households is possible. Agricultural diversification necessitates the production of different food crops or cash crops (e.g., cashew, cocoa, etc.). In contrast, non-agricultural diversification necessitates the participation in non-agricultural revenue streams such as non-farm wage employment, non-farm rural employment, rural wage from the non-farm sector, trading, and earnings from distant relations to an agrarian family.

Two sets of narratives have been documented in the literature on motives for diversification of income sources. The first is the push factor (distress-push). These unfavorable conditions may force farm households to seek alternative sources of income within or outside the farm. They tend to dominate in an agricultural setting characterized by high risk and low potentials, such as those affected by drought, flooding, and environmental degradation. Further from the push

factor perspective, livelihood diversification arises when people from rural enclaves undertake poor-yielding non-farm activities out of the need to guarantee their living, lower the risk of hunger and prevent slipping further into poverty (Hirzel & Le Lay, 2008). Should the crop fail or animals lost, households are liable to reallocate labour resources to other economic sectors that may include formal non-farm occupation or non-farm rural wage, informal engagement in off-farm activities (e.g., scouting for wild animals, wage labour working from other peoples' farms), or non-agricultural/non-farm activities (e.g., weaving, brewing). Much as the poor are likely to pursue distress push diversification due to their inability to manage risks, so are the risk-preference poor individuals with clear evidence of differentiated wealth likely to pursue *ex-ante* diversification.

The second set of the narrative rests on the pull factor (demand-pull diversification) perspective. These favourable factors with a positive outcome induce farm families to participate in other income sources to improve their living conditions. They motivate farmers to diversify their income sources beyond farm activities by improving earnings from non-farm sector. These factors prevail in low-risk and high-potential agro-ecological regions (Haggblade *et al.*, 2007). In light of the pull-factor perspective, rural households are motivated by the incentives to engage in high-earning activities from the non-farm sector, aiming to accumulate wealth and maximize asset returns (Loison & Loison, 2016).

Available reports show that subsistence agriculture provides a means of living for 20-25% of the world's population (Davies *et al.*, 2010). Most of these people are classified as smallholder farming households, or their activities reflect peasant livelihoods. Given the dominance of rural people in subsistence agriculture and other activities, this study is essential for a variety of reasons: (i) most rural poor rely directly or indirectly on peasant livelihoods; (ii) rural poor predominantly depend on peasant farming directly or indirectly; (iii) peasant agriculture is essential to national and global economies in terms of contribution to food and livestock production, environmental effects and limited natural resources; (iv) potential market for consumer goods and services if rural people's welfare improves. Thus, empirical analysis of rural livelihoods is expected to improve the understanding of income strategies of farming households in a bid to achieve their livelihood goals. It also provides valuable insights for policymakers on factors that influence the choice of a specific livelihood or livelihood combination to provide the necessary institutional support for achieving sustainable rural livelihoods.

Several studies have been conducted on livelihoods or diversification strategies, with mixed findings explaining the determinants of farming households' livelihoods and diversification strategies. While some studies (David, 2013; Gani, 2015; Kassie *et al.*, 2017; Gebru *et al.*, 2018;), reported a negative influence of improved socio-economic status (e.g., education, access to credit, remittances, proximity to the market, etc.) on livelihood diversification, the positive influence of these variables were reported by some other studies (Adugna & Wagayehu, 2015; Lorato, 2019; Combarry, 2015). The foregoing suggests a dearth in the literature that this study intends to fill using the concept of livelihood strategy to disaggregate the components of rural livelihoods with each household identified by mutually exclusive choice of rural livelihoods.

The methodological debate on livelihood studies revealed that some studies (Khartum & Roy, 2012; Awoniyi & Salman, 2014) used the income share obtained from different income-generating activities to group households into 'diversified' and 'non-diversified' using sectorial classification proposed by Barrett *et al.* (2001). However, relying on estimates obtained from direct use of income or income share could be misleading due to the random nature of income which has the intrinsic to make significant fluctuations in perceived income sources over time (Barrett *et al.*, 2001). Even if income is not stochastic, measuring income for some activities, including farming, particularly in developing countries, is difficult.

Mensah (2014) and Mohammed (2014) quantified rural livelihoods using a checklist of livelihood activities pursued and stratified households into 'diversified' (i.e., on-farm + non-farm activities) and non-diversified (on-farm activity only) using Barrett *et al.* (2001) sectorial classification. Although this approach is known for its computational simplicity, the authors failed to empirically account for the relative contributions of other rural livelihood activities to a household's income portfolio. For example, some activities with low entry barriers, such as agricultural wage labour or environmental gathering, cannot be classified as on-farm or non-farm. Therefore, classifying them into non-farm activity could yield a misleading result in view of overwhelming empirical evidence of the negative impact of non-farm income strategy on a household's welfare.

With the exception of studies conducted in Tanzania and Ethiopia (Bongole, 2016; Gebru *et al.*, 2018; Lorato, 2019;), this study contributes to the literature as it intended to use the income portfolio analysis and activity variables to cluster farming households into a mutually exclusive choice of rural livelihoods taking into consideration the diverse nature of activities engaged by rural households towards achieving their livelihood goals. The questions that are central to this study are:

- What choice(s) of livelihoods were pursued by farming households in Southwestern Nigeria?
- To what extent has the household socio-economic profile affected the choice of rural livelihoods in the study area?
- What factors determine the choice of rural livelihoods pursued by farming households?

## 2. Methodology

### 2.1. Study Area

This study was conducted in Southwestern Nigeria. It is one of the six geo-political zones in the country. The South-west consists of six states: Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti State. The zone lies between latitude 6° 00' 21" and 8° 00' 37" North (Faleyimu *et al.*, 2010) and longitude 2° 00' 31" and 6° 00' 01" East. It shares a border with Kogi and

Kwara states in the northern part, the Atlantic Ocean in the southern part, Edo and Delta states in the eastern part, and the Republic of Benin in the western part.

The Southwest has a land area of about 114,271 square kilometres with a total population of 27,581,992 (NPC, 2006). The zone houses the Yoruba ethnic group. The zone has a distinct feature of tropical climate marked by a dry season between November and March and a wet season between April and October. The average annual rainfall distribution is 1480mm, with a mean monthly temperature range of 18°C-24°C and 30°C-35°C during the rainy and dry seasons. The vegetation cover of the southwestern zone consists of fresh water and mangrove. The crops such as rice, maize, sorghum, cowpea, groundnut, yam, potato, cassava, and soya bean are predominantly grown in the area. The people of the zone also practice fishing, poultry, livestock husbandry, and non-farm activities such as trading and wage employment.

2.2. Sampling Procedure

The multi-stage sampling procedure was used for the study. In the first stage, Osun and Ekiti states were purposively selected from the six states of Southwestern Nigeria because the two states have the highest poverty ranking and, by extension, food insecurity (NBS, 2016). The second stage entailed random selection of two out of the three ADP zones in each of the two states, making a total of four ADP zones. ADP is known to coordinate agricultural activities in Nigeria. ADP is administratively structured into zones, blocks, and cells. The zone has at least four or five Local Government Areas or blocks, while the cell consists of numerous villages that are situated in the block. In the third stage, there was a random selection of seven and four blocks from the selected ADP zones of Osun and Ekiti states, making a total of eleven blocks (11 LGAs) in the selected two states. Finally, in the last stage, four hundred (400) farming households were randomly chosen from the two states proportionate to the size of the selected villages.

2.3. Methods of Data Analysis

The study employed several analytical techniques in order to achieve the stated objectives. These include descriptive statistics, chi-square statistics, income portfolio analysis, and multinomial logit model.

2.3.1. Income Portfolio Analysis

The choice of rural livelihoods pursued by farming households was identified using the ‘income portfolio analysis’. This involved identifying people by income proportion received from various sectors of the rural economy classified by Ellis (1998) and Barrett *et al.* (2001) as follows:

- Farm income: This is the income type obtained from the use of land inherited, purchased, rented, or accessed by share tenancy for agricultural activities, including crop, livestock, fishery, and forestry.
- Off-farm income: This is the type of income or wage earned from the use of own labour hired on other farms within the context of Agriculture.
- Non-farm income: This includes earnings from non-agricultural sectors such as non-farm employment, transfer income, rents received, rural wage, and earnings from distant relations to an agrarian household (Ellis, 2000).
- From the foregoing classification and following the works of Kassie *et al.* (2017), and Gebru *et al.* (2018), farming households were identified and grouped into four mutually exclusive livelihoods’ choices as: on-farm (agriculture only); on-farm with off-farm (ONF-OF), on-farm with non-farm (ONF-NF) and on-farm, off-farm and non-farm (ONF-OF-NF) choice of rural livelihoods (Aboud *et al.*, 2001).

2.3.2. Multinomial Logit Model

The factors determining the choice of rural livelihoods were analyzed using the multinomial logit model. Multinomial logit is suitable for qualitative response modeling, given that the response variable is unordered or nominal in character (Greene, 2012). Therefore, following Greene (2003) and as further adopted by Rahji (2005) and Gani (2015), the probability that the *i*<sup>th</sup> household with *x* characteristics chooses the *j*<sup>th</sup> choice of rural livelihoods was modeled as follows:

$$P_{ij} = \frac{\exp(M_i\beta_j)}{\sum_{j=0}^J \exp(M_i\beta_j)} \quad \text{For } j = 0, \dots, J \dots\dots\dots (1)$$

Given that  $\sum_{j=0}^J P_{ij} = 1$  for any other *l*, where  $P_{ij}$  = probability representing the *i*<sup>th</sup> respondent’s chance of adopting any of the *J* categories; *M* =determinants of choice probability;  $\beta_j$  = covariate effects specific to *j*<sup>th</sup> response category. The choice of this model was rooted in the assumption of optimal allocation of asset endowment by the *i*<sub>th</sub> household to pursue livelihoods that maximize its utility (Brown *et al.*, 2006). The baseline and reference group that was used in this study was ‘on-farm with off-farm’ livelihood against which other livelihoods’ choices were compared. Let  $P_r (Y_{ij} = Q/M)$  be the probability of observing outcome  $Y_{it}$ , given *M*. The probability model for  $Y_{ij}$  can be constructed as:

$$P_r (Y_{ij} = Q/M) = \frac{\exp(\beta_0 + \beta_1 M_{2i} + \dots + \beta_k M_{ri})}{\sum_{j=0}^k \exp(\beta_0 + \beta_{ij} M_{2i} + \dots + \beta_{kj} M_{si})} \dots\dots\dots (2)$$

for  $J = 0, 1, 2, \dots, K$ .

$$Pr_{ij} = \frac{\exp(\beta_j M_i)}{1 + \sum_{j=0}^k \exp(\beta_j M_i)} \dots\dots\dots (3)$$

For  $j = 1, 2, 3$  and  $i = 1, 2, \dots, 15$

$$Pr_{i0} = \frac{1}{1 + \sum_{j=0}^k \exp(\beta_j M_i)} \quad \text{For } j = 0 \dots\dots\dots (4)$$

In equation (4),  $Pr_{ij}$  is the probability of choosing the  $j^{th}$  livelihoods, while  $Pr_{i0}$  in equation (5) is the probability of choosing the reference category. In practice, estimating this model requires that the coefficients of the reference category are normalized to zero (Greene, 1993). This is because the summation of probabilities for all the choices must be equal to unity (Greene, 1993). As a result, only (4-1) separate sets of parameters can only be determined. The estimated equation was given by the natural logarithms of the odds ratio of equation (3) (Greene, 1993) as:

$$\ln\left(\frac{P_{ij}}{P_{i0}}\right) = \beta_{ij}M_i \dots\dots\dots (5)$$

For  $i = 1, 2, \dots, 15$ . and  $j=1, 2, 3$ .

The relative probability of  $Y=j$  gave the Relative Risk Ratio (RRR) or odds ratio  $\left(\frac{P_{ij}}{P_{i0}}\right)$  compared to the base category  $Y=0$ .

The  $\beta_{ij}$  parameter estimates determine the influence of a unit increase in the relevant explanatory variables on the log odds ratio of a given choice of livelihoods compared to the base category. However, the coefficients of the reference group can be calculated using Hill's (1983) formula:

$$Y_v = - (Y_1 + Y_2 + \dots + Y_{v-1}) \dots\dots\dots (6)$$

$$\beta_2 = - (\beta_1 + \beta_3 + \beta_4) \dots\dots\dots (7)$$

Equation (7) implies that the negative of the sum of the parameters for groups 1, 3, and 4 is the coefficient of the reference group for each explanatory variable in the reference group. This study modeled the choice of rural livelihoods as  $Y_{ij} = f(M_i)$ , where  $Y_{ij}$  assumes a value from 0, 1, 2, and 3 if a household  $I$  chooses a particular livelihood. The multinomial logit model in its explicit functional form was specified as follows:

$$Y_1 = \alpha_1 + \beta_1M_1 + \beta_2M_2 + \dots + \beta_{15}M_{15} + \epsilon_t \dots\dots\dots (8)$$

$$Y_2 = \alpha_2 + \beta_2M_1 + \beta_3M_2 + \dots + \beta_{15}M_{15} + \epsilon_t \dots\dots\dots (9)$$

$$Y_3 = \alpha_3 + \beta_3M_1 + \beta_4M_2 + \dots + \beta_{15}M_{15} + \epsilon_t \dots\dots\dots (10)$$

Where  $M_1 \dots M_n$  denotes the vector of the independent variables, with  $n = 1 \dots 15$ .  $\beta_1 \dots \beta_n$  denotes the parameter coefficients.  $\epsilon_i$  is an error term with normal distribution, and  $\alpha_1, \alpha_2$ , and  $\alpha_3$  show the constant term. The explanatory variables following the works of (David, 2013; Adugna & Wagayehu, 2015; and Gebru *et al.*, 2018) that were expected to influence the  $j^{th}$  choice of rural livelihoods are as follow:

**2.3.3. Definition of Variables**

The choice of variables was informed by economic theories, econometric properties, and previous empirical studies on livelihoods and diversification strategies in Nigeria and other developing countries.

**2.3.3.1. Demographic and Socio-Economic**

$M_1$  = Age of household head (years),  $M_2$ = Gender of household head (1= male, 0 otherwise)  
 $M_3$  = Marital status (1= married 0 otherwise),  $M_4$  =Household head completed Primary education (1=yes, 0 otherwise),  
 $M_5$  = Post-primary education of household head (1=yes, 0 otherwise),  $M_6$ = Dependency ratio (non-working /working members of the household)

**2.3.3.2. Economic (Production/Exchange)**

$M_7$  = Access to credit (1=yes, 0 otherwise),  $M_8$  = Land area in use (ha),  $M_9$  = Access to irrigation facilities (1=yes, 0 otherwise).

**2.3.3.3. Institutional Influence**

$M_{10}$  = Frequency of contacts with extension agent in a year,  $M_{11}$  = Distance to the nearest market from dwelling (km),  
 $M_{12}$  = Access to the national grid (1= yes, 0 otherwise),  $M_{13}$  = Membership of social organization (1= yes, 0 otherwise).

**2.3.3.4. Vulnerability/Resilience**

$M_{14}$  = Livestock ownership (Tropical Livestock Unit),  $M_{15}$ = Access to remittances (1= yes, 0 otherwise)

**2.3.3.5. Marginal Effects and Quasi Elasticity of the Multinomial Logit Model**

According to Greene (1993), there is difficulty in interpreting the coefficients of the multinomial logit model. However, differentiating equations (4) and (5) gives the marginal effects or partial derivatives  $\left(\frac{\delta P_j}{\delta X_i}\right)$  of the regressors on the probability of adopting the  $j^{th}$  livelihoods as follows:

$$\frac{\delta P_j}{\delta X_i} = P_j(\beta_j - \sum_k P_k \beta_k) \dots\dots\dots (11)$$

Where  $j = 1, 2 \dots J$ . and  $k = 1, 2 \dots J$ .

This study's marginal effects or partial derivatives were obtained using Stata 15. Subsequently, quasi elasticities were obtained from the marginal effects using  $\eta_{ji} = \bar{X} (' \delta P_j / \delta X_i)$ , where  $\bar{X}$  is the mean value of  $X_i$ . The method of deriving the quasi elasticities implicitly indicates that the sign and magnitude of the marginal effects do not have to be related to the sign of the coefficients used to obtain them (Greene, 1993). The quasi elasticities show the percentage point change in the probability of adopting the  $j^{th}$  livelihood  $P_j$  upon a one percent change in the relevant regressor,  $M_i$ . By virtue of the

simplicity of interpretation, quasi elasticities are found to be preferable to the coefficients and partial derivatives (Rahji, 2005). The signs and values of quasi elasticities can also change when evaluated at different points (Basant, 1997).

2.3.3.6. Likelihood Ratio Test

Hypothesis:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \dots = \beta_k = 0; \quad H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \dots \neq \beta_k \neq 0$$

$$X^2_{stat} = -2[LLR - LLF] \dots\dots\dots (12)$$

Where LLF = log-likelihood for the full model; LLR = log-likelihood for the restricted model. LLF is obtained from the estimated multinomial logit model with a constant parameter, while LLR ( $L_0$ ) is obtained from the estimated model with only a constant parameter and is computed as follows:

$$L_{(0)} = \sum_{j=0}^J n_j \ln P_j \dots\dots\dots (13)$$

$$L_{(0)} = n_0 \ln P_0 + n_1 \ln P_1 + n_2 \ln P_2 + n_3 \ln P_3 \dots\dots\dots (14)$$

Decision rule: accept  $H_1$ , if  $X^2_{stat} > X^2_{tab(0.01,48)}$   
 $X^2_{stat} > X^2_{tab(0.05,48)}$

3. Results and Discussion

3.1. Distribution of Respondents by Socio-Economic Characteristics

Table 1 shows the distribution of the respondents based on socio-economic factors. The results, as presented in the table, show that the majority of the respondents were male (81.4%), married (90.7%), and had 6-10 members of the household (61.1%). Also, the majority (60%) of the respondents were between the ages of 36 and 55 years, while 7.40% were aged 35 years or less. The mean age of the sampled population was about 52 years suggesting that the relatively aging farmers dominated farming activities in the study area. The literacy level among the sampled respondents was high as 90.9% completed at least primary education, while only 9.04% had no formal education. The mean years of formal education were approximately 10 years. The high literacy level implies high exposure and adoption of innovations and improved technologies among the respondents. The primary occupation for most of the respondents was farming (78.6%), with an average of sixteen (16) years of experience.

Characteristics	Frequency	Percent
<b>Gender of Household Head</b>		
Male	297	81.37
Female	68	18.63
<b>Age of Household Head</b>		
≤35	27	7.40
36-45	98	26.85
46-55	20	32.87
56-65	72	19.73
>65	48	13.15
Mean	51.92	(11.38)
<b>Marital Status</b>		
Married	331	90.68
Single	14	3.84
Widowed	17	4.66
Divorced	3	0.82
<b>Household Size</b>		
1-5	87	3.84
6-10	223	61.10
11-15	47	12.88
>15	8	2.99
Mean	8	(3)
<b>Education</b>		
No formal education	33	9.04
Primary	94	25.75
Secondary	123	33.75
Tertiary	115	31.51
<b>Primary Occupation</b>		
Farming	287	78.63
Non-farming	78	21.37
<b>Farming Experience</b>		
≤10	152	41.64
11-20	114	31.23
>20	99	27.13
Mean	16.76	(10.57)
<b>Characteristics</b>	<b>Frequency</b>	<b>Percent</b>
<b>Access to Credit</b>		

Characteristics	Frequency	Percent
No	93	25.50
Yes	272	74.52
<b>Monthly Income</b>		
≤30,000	58	15.89
30,001-60,000	93	25.50
>60,000	214	58.63
Mean	57,422.30	(59,236.4)

Table 1: Distribution of Respondents by Socio-Economic Characteristics

Source: Author's Computation from Field Survey, 2019. Values In Parenthesis Are Standard Deviation

This implies that most of the respondents were likely to benefit from improved productivity and earning capacity as a result of the error correction mechanism in farm and agricultural practices. In addition, most of the respondents had access to at least a source of microcredit (74.5%). Considering the mean monthly income of the respondents, the results show that one-quarter (25.5%) of the respondents earned above N60,000 monthly, while 35.6% earned at most N30,000 monthly and 38.63% earned between N30,001 and N60,000 monthly. The mean monthly income in the study area was N57, 422.3.

### 3.2. Distribution of Respondents by Rural Livelihoods' Choices

Table 2 presents the distribution of respondents by choice of the rural livelihoods pursued. The results, as presented in the study, revealed that four mutually exclusive choices of rural livelihoods were identified in the survey. They included the following:

$Y_1$  = Those that pursued on-farm (Agriculture) only.

$Y_2$  = Those that pursued on-farm + off-farm.

$Y_3$  = Those that pursued on-farm + non-farm.

$Y_4$  = Those that pursued on-farm + off-farm+ non-farm.

As presented in table 2, the least-pursued choice of rural livelihoods in the study area was 'on-farm' (Agriculture), consisting of 3.56% of the respondents. This was the modal choice of livelihoods pursued. The inability of most respondents to specialize in farming and agricultural

activities (on-farm) and deriving superior returns from using improved technologies with a competitive advantage might be responsible for crowding out most of the respondents from this livelihood choice. About 17.8% and 9.7% pursued on-farm with off-farm (ONF-OF) and on-farm with non-farm (ONF-NF) rural livelihood choices, respectively. In comparison, the majority (58.9%) of the respondents pursued the most-diversified choice of rural livelihoods involving the combination of on-farm, off-farm, and non-farm (ONF-OF-NF) activities.

Livelihood activities	Livelihoods' choice	Frequency	%
Production of food and cash crops; Livestock and fisheries/aquaculture	On-farm (Agriculture)	13	3.56
Production of food and cash crops, Livestock and fisheries/aquaculture; Agricultural wage labour, Environmental gathering and rent	On-farm + Off-farm	65	17.81
Production of food and cash crops, Livestock and fisheries/aquaculture; Salaried job (Private & Government), Trading, Craft & Artisans, Transfers, Remittances and pension	On-farm + Non-farm	72	19.73
Production of food and cash crops, Livestock and fisheries/aquaculture; Agricultural wage labour, Environmental Gathering and rent of farm land; Salaried job (Private & Government); Trading, Craft & Artisans, Transfers, Remittances and pension	On-farm + Off-farm + Non-farm	215	58.90

Table 2: Distribution of Respondents by Rural Livelihoods' Choices

This finding is consistent with Obi and Njoku (2014), who reported that male-headed, small-sized households and relatively wealthy and formally educated households were less likely to earn their livelihoods outside on-farm livelihood. On the other hand, higher education was associated with enhanced human capital, increased productivity, and improved well-being, giving farming households the incentives to specialize in on-farm livelihood. Further, a significant difference exists between farm size and the choice of rural livelihoods. The results from table 4 revealed that the highest percentage of the respondents who specialized in 'on-farm livelihoods' was found among holders of farm sizes between 2.1 and 3.0 hectares (14.8%). In comparison, the least percentage of the respondents with specialization in on-farm livelihood choice was found among those with a farm size of at most 2 hectares (2.5%). This finding is consistent with Combarry (2015), who found that households pursuing the most-diversified rural livelihoods had significantly small farm holdings. A significant difference was also found between access to credit and the choice of rural livelihoods. With access to credit, households

were found to be more specialized in on-farm rural livelihood (4.1%), compared with 3.7% of the respondents who had no access to credit. A significant difference was found between the agro-ecological zone and the choice of rural livelihoods pursued by the respondents. The results from table 4 show that households who resided in rain-forest agro-ecological zone pursued the most diversified (45.6%) livelihoods and were more specialized (7.4%) in on-farm, compared with households who resided in savanna/derived savanna agro-ecological zone with 62% engaging in the most-diversified livelihood, while just about 3% specialized in on-farm livelihood. Ntwenya *et al.* (2015) reported a similar finding.

Makita (2016) reported that the motives to specialize in agriculture (on-farm) livelihood prevail in a region with favourable conditions for agricultural production, including low risk of prolonged drought, land degradation, flooding, and extreme weather events. Further, the results from table 4 show that there was a significant relationship between the income class of the respondents and the choice of rural livelihoods. It was revealed that the largest proportion (29.8%) of the respondents in the lowest income class with an average monthly income of ₦30,000 or less were found among the respondents who pursued the most-diversified livelihoods (ONF-OF-NF), while the lowest percentage (2.8%) of the respondents who derived their livelihoods exclusively from on-farm livelihood (ONF) and with an average monthly income of above ₦60,000 were in the highest income category.

### 3.3. Rural Livelihoods' Profile across the Selected Socio-Economic Characteristics

As presented in table 4, the result shows that a significant difference exists between gender and the choice of rural livelihoods undertaken by farming households. Households headed by females were found to pursue the most diversified rural livelihoods involving the combination of ONF-OF-NF activities (66.2%), compared to 58.4% of the male-headed households suggesting that cultural factors restricted female-headed households from having full control or ownership of production factors such as land for farming activities. Hence, they diversified into off-farm and/or non-farm activities to complement the farm income. In addition, there was a significant difference between educational attainment and the choice of rural livelihoods as the highest percentage (81.8%) of the most livelihood-diversified households was found among household heads with no formal education. In comparison, the lowest percentage (53.9%) was found among the household heads with tertiary educational achievement.

### 3.4. Determinants of Rural Livelihoods' Choices among Farming Households

The results of the multinomial logit model (MNL), Relative Risk Ratio (RRR), marginal effects, and quasi elasticities of the significant variables in the basic multinomial logit model were presented in this section. In addition, the results presented in tables 4 and 5 revealed that the overall fitness of the model, as shown by the log-likelihood estimate of 297.044 and Chi-square value of 178.26, was statistically significant, indicating a good fit for the model.

Characteristics	ONF (%)	ONF-OF (%)	ONF-NF (%)	ONF-OF-NF (%)
<b>Gender</b>				
Male	4.37	20.20	18.18	58.38
Female	1.4	5.88	26.47	66.18
$\chi^2$		10.37***		
<b>Educational Level</b>				
No formal	3.03	3.03	12.12	81.82
Primary	3.19	21.28	19.15	56.38
Secondary	2.44	18.69	19.51	59.35
Tertiary	6.09	17.39	22.61	53.91
$\chi^2$		12.11*		
<b>Farm Size</b>				
0-2.0	2.52	18.57	23.21	55.70
2.1-3.0	14.82	22.22	14.81	48.15
>3.0	3.96	13.86	12.87	69.31
$\chi^2$		17.79***		
<b>Access to Credit</b>				
Yes	4.09	9.84	19.67	66.39
No	3.70	21.40	19.75	55.14
$\chi^2$		7.97**		
<b>Agro-ecological Zone</b>				
Rain forest	7.36	36.76	10.29	45.59
Others	3.03	13.13	21.89	61.95
$\chi^2$		26.61***		
<b>Income (₦)</b>				
≤30,000	7.02	50.88	12.28	29.82
30,000-60,000	4.26	15.96	28.72	51.06
>60,000	2.81	9.34	17.76	70.09
$\chi^2$		66.19***		

Table 3: Rural Livelihoods' Profile across the Selected Socio-Economic Characteristics

Source: Author's Computation from Field Survey, 2019. \*\*\*, \*\* and \* Indicate 1%, 5% and 10% Levels of Significance Respectively. ONF= On-Farm; ONF-OF= On-Farm + Off-Farm; ONF-NF= On-Farm+ Non-Farm; ONF-OF-NF= On-Farm+ Off-Farm + Non-Farm

The LR statistics presented in table 6 and indicated by ( $\chi^2$ ) value of 178.26 was statistically significant at both 1% and 5% levels confirming that the estimated coefficients are all significantly different from zero. Table 5 revealed that eleven (11) out of the sixteen (16) independent variables specified were significant at 1% ( $p < 0.01$ ), 5% (0.05) and 10% (0.1) levels representing about 70% of the total independent variable.

They included gender of the respondents, age, being married, dependency ratio, post-primary education, farm size, Tropical Livestock Unit (TLU), access to irrigation, distance to the market, remittances, and access to the national grid (electricity).

#### 3.4.1. On-farm (ONF) livelihood

The factors influencing a farming household's choice of on-farm livelihoods were age, dependency ratio, farm size, and distance to the market. The odds of pursuing on-farm livelihoods relative to the base category were reduced by 95.2% with an increase in the age of the respondents. The possible reason is that the relatively younger household heads tend to be more productive; hence they derive superior returns from specializing in on-farm livelihoods than a choice to diversify into off-farm activities with poor remuneration. This finding is consistent with Adugna and Wagayehu (2015) and Gebru *et al.* (2018). Furthermore, in line with prior expectations, the odds of pursuing on-farm livelihood relative to the base category by the respondents were reduced by 67.6%, with an increase in dependency ratio. This implies that an increase in the number of economically inactive household members reduces the ability of the households to meet the family's subsistence needs. Consequently, the fall in real income per capita resulting from a high dependency ratio might force the household head to diversify into off-farm activities *through ex-post* coping strategies. This finding is consistent with Adepoju and Obayelu (2013).

As expected, the odds of pursuing on-farm livelihoods relative to the reference category increased by 60.6% with farm size. Studies have shown that households with larger farm sizes are found to derive their livelihoods exclusively from agriculture (Babatunde, 2013). This finding implies that rural households tend to specialize in on-farm when there is an incentive to increase their farm size. Shariff (2002) also found that per-capita farm size was negatively associated with poorly remunerative farm wage employment and occupations with low productivity. This finding is in agreement with Adugna and Wagayehu (2015). As expected, the odds of pursuing on-farm relative to the reference category were reduced by 79.1% with a unit increase in market distance. This implies that the inability of farming households to access market institutions at little or no transaction cost affects their productivity and income levels. This might push them to pursue additional income in off-farm activities to smoothen their consumption.

#### 3.4.2. On-Farm with Non-Farm (ONF-NF)

Access to irrigation, national grid (electricity), and remittances positively influenced the choice of ONF-NF rural livelihoods. At the same time, sex and farm size were negative and significantly influenced the choice of ONF-NF livelihoods.

The odds of male-headed households pursuing combined ONF-NF rural livelihood relative to the reference category were reduced by 36.2%, implying that households headed by a male were not likely to pursue ONF-NF livelihood. The possible reason is that cultural factors often restrict rural women in developing countries from controlling and ownership of land for farming activities. Hence, they tend to combine petty trading with their smallholding farm plot to reduce their vulnerability to poverty and food insecurity. This finding is in dissonance with Lorato (2019) but consistent with Gani (2015).

As expected, the choice of combined ONF-NF livelihoods was negatively and significantly influenced by farm size. The odds of pursuing ONF-NF relative to the base category were reduced by 88.1% with an increase in farm size. This finding is consistent with Adugna and Wagayehu (2015) and Bongole (2016) but inconsistent with Gebru *et al.* (2018). On the other hand, the odds of pursuing the choice of ONF-NF livelihoods relative to the base category increase by 5.2% with access to irrigation facilities. This implies that access to irrigation facilities has the potential to extend the planting season beyond the conventional reach of rain-fed agriculture.

Consequently, the increase in output and income allows farming households to diversify *ex-ante* into non-farm activities. This finding is in line with Gebru *et al.* (2018). As expected, the odds of pursuing the choice of ONF-NF livelihoods relative to the base category increase by 62.2% with increased earnings from the remittances. This implies that access to remittance income is critical in smoothing household consumption, increasing savings, and thus accessing diverse opportunities in the non-farm sector. Gebru *et al.* (2018) reported similar findings.

As expected, respondents' access to the national grid increases the odds of pursuing ONF-NF livelihood relative to the base category by 95.3%. This implies that access to the national grid can significantly contribute to household income through employment in rural non-farm wages, reduction in transaction costs, and reduced vulnerability to income shock and food insecurity.

#### 3.4.3. On-Farm, Off-Farm, and Non-Farm (ONF-OFF-NF)

3 out of the 6 statistically significant independent variables, including gender, post-primary education, and Tropical Livestock Unit (TLU), were negative and significant. At the same time, the remaining three-marital status, remittances, and access to the national grid had a positive and significant influence on the choice of ONF-OFF-NF livelihoods.

Variables	ONF	ONF-NF	ONF-OF-NF
Age	0.9520 (-1.72)*	0.9870 (-0.63)	0.9840 (-0.54)
Sex	0.9380 (-0.05)	(0.362) (-1.74)*	(0.357) (-1.56)*
Marital status	2.2540 (0.62)	1.3800 (0.45)	3.2740 (1.69)*
Dependency ratio	0.6760 (-2.02)**	1.0600 (0.78)	0.919 (-1.20)
Primary Education	0.7670 (-0.32)	0.7570 (-0.58)	0.7670 (-0.62)
Post Pry. Education	0.3880 (-0.66)	0.1970 (-1.30)	0.0800 (-2.21)*
Farm size	1.0660 (1.75)*	0.8810 (-1.64)*	0.9350 (-0.82)
Extension contact	1.0130 (0.42)	1.0230 (1.04)	1.0260 (1.36)
Livestock ownership	0.9720 (-0.34)	0.9820 (-0.64)	0.9430 (-1.58)*
Irrigation access	1.7670 (0.54)	3.0520 (1.58)*	2.2850 (1.24)
Credit access	1.251 (0.27)	1.773 (1.12)	1.6350 (1.04)
Remittances	3.8700 (-0.01)	51.6220 (3.61)***	74.7680 (4.09)***
Access to National grid	1.1940 (0.22)	4.9530 (3.33)***	3.0570 (2.70)***
Distance to market	0.7910 (-1.70)*	0.9660 (-0.30)	0.9690 (-0.30)
Org. membership	1.4970 (0.42)	0.8060 (-0.43)	1.2450 (0.46)
Constant	16.9740 (0.91)	65.5060 (2.05)***	270.0680 (2.96)***
<b>Model Summary</b>			
Observation:	365	LR CHI <sup>2</sup> (48):	178.26
Pseudo R <sup>2</sup> :	0.2308	Prob. > CHI <sup>2</sup> :	0.0000
Log likelihood:	-297.044		

Table 4: RRR Calculated From the Estimated Multinomial Logit Model for Factors Influencing the Choice of Rural Livelihoods

Source: Author's Computation from Field Survey, 2019. Number in Parentheses Are Z-Values, \*\*\*, \*\* and \* Indicate 1%, 5% and 10% Levels of Significance Respectively

The odds of male-headed households pursuing the most diversified rural livelihoods involving the combination of ONF-OF-NF activities relative to the base category were reduced by 35.7%. This implies that women, particularly in developing countries, are often faced with a higher risk of falling deeper into poverty and food insecurity than their male-headed counterparts (FAO, 2015). Hence, they tend to diversify into a broad range of income sources to smoothen their consumption.

The highly remunerative rural non-farm employment often requires formal education, with the minimum qualification of completed secondary education. In contrast to the prior expectation, the odds of household heads with post-primary educational attainment pursuing the most diversified rural livelihoods (ONF-OF-NF) relative to the base category were reduced by 80%. The possible reason is that farming households with post-primary educational attainment may have realized the low remuneration in pursuing multiple livelihood activities involving the combination of ONF-OF-NF activities due to poor competitive advantage induced by the inability to specialize and take advantage of superior technology. Consequently, they tend to specialize in agriculture, where enhanced productivity is guaranteed with improved technologies and optimal allocation of productive resources. This finding is in line with Adugna and Wagayehu (2015) but contradicts Gebru *et al.* (2018) and Lorato (2019).

As expected, the odds ratio revealed that the likelihood of pursuing combined ONF-OF-NF livelihoods relative to the base category was reduced by 94.3%, with an increase in the tropical livestock unit (TLU). This implies that the farming household heads had no incentive to combine on-farm with off-farm and non-farm activities because with the livestock holdings, they could make more earnings from the sale of livestock and thus strengthen their financial resources against idiosyncratic and covariate shocks. This finding is consistent with Adepoju and Obayelu (2013), Gebru *et al.* (2018), and Lorato (2019).

As expected, the odds of married household heads and earnings from remittance to pursuing the choice of ONF-OF-NF livelihoods were increased by 27.4% and 76.8%, respectively. This implies that married household heads tend to pursue multiple income sources in response to the rising household expenditure profile that occurs when the size of the household increases. On the other hand, earnings from remittances enabled the respondents to engage in new business opportunities so as to maintain or enhance their livelihoods. This finding is consistent with Gani (2015). In line with prior expectations, the odds of farming household heads with access to the national grid pursuing ONF-OF-NF relative to the base category were increased by 5.7%. This implies that access to the national grid availed the respondents the benefit of positive externality inherent in public goods, such as opportunities to participate in rural non-farms

Chi <sup>2</sup> statistics	Chi <sup>2</sup> <sub>tab</sub> (0.01, 48)	Chi <sup>2</sup> <sub>tab</sub> (0.05, 48)	Decision Rule
178.26	76.154	67.505	H <sub>1</sub> is accepted

Table 5: Result of Likelihood Ratio Test  
Source: Author's calculation from field survey, 2019

### 3.5. Marginal Effects and Quasi Elasticity

Table 6 presents the marginal effects and quasi elasticities of the significant variables in table 4. Owing to the ease of interpretation, quasi elasticities are superior to the odds ratio and the partial derivatives (Basant, 1997). As shown in table 6, the quasi elasticity of marital status, post-primary education, and dependency ratio were inelastic, being 0.1584, 0.2502, and 0.0544, respectively, for the choice of combined ONF-OF-NF livelihood. The quasi elasticities of marital status, access to the national grid (i.e., electricity), and dependency ratio were inelastic, being 0.0841, 0.0744, and 0.0690, respectively, for the choice of combined ONF-NF livelihood. The quasi-elasticity of dependency ratio was also inelastic being 0.0377 for the choice of on-farm (ONF) livelihood. The interpretation is that if a given or a set of independent variables is elastic, it implies that, for one percent change in these variables, a more than proportionate change in the probability of adopting j<sup>th</sup> choice of rural livelihoods is observed. However, for the inelastic variable(s), it implies that a slight change does not largely influence the probability of adopting the j<sup>th</sup> choice of rural livelihoods in these variables as one present change in the variable(s) leads to a change in the likelihood of adopting the j<sup>th</sup> choice of rural livelihoods by less than one percent.

Variables	ONF 13	ONF-OF 65	ONF-NF 72	ONF-OF-NF 215
Age	-0.0013 (-0.0667)	0.0014 (0.0718)	-0.0005 (-0.0256)	0.0004 (0.0205)
Sex	0.0209 (-0.0667)	0.0888 (0.0722)*	-0.0312 (0.0254)	-0.0785 (0.0639)
Marital Status	0.0033 (0.0030)	-0.0854 (-0.0774)	-0.0927 (-0.0841)*	0.1747 (0.1584)**
Post pry education	0.0178 (0.0162)	0.2019 (0.1836)**	0.0554 (0.0504)	-0.2751 (-0.2502)**
National grid	-0.0219 (-0.0152)	-0.1110 (-0.0772)**	0.1069 (0.0744)**	0.0261 (0.0182)
Dependency ratio	-0.0111 (-0.0377)*	0.0067 (0.0228)	0.0203 (0.0690)***	-0.0160 (-0.0544)*
Farm size	0.0038 (0.0104)	0.0069 (0.0189)	-0.0113 (-0.0310)	0.0006 (0.0050)
Livestock	0.0001 (0.0002)	0.0041 (0.0093)*	0.0042 (0.0096)	-0.0086 (0.0196)
Irrigation access	-0.0022 (-0.0002)	-0.0841 (0.0106)	0.0668 (0.0084)	0.0195 (0.0025)
Remittances	-0.4821	-0.2513	0.1524	0.5811
Market	(-0.1268)	(-0.0661)	(0.0401)	(0.1528)
Distance	-0.0066 (-0.0165)	0.0048 (0.0120)	-0.0003 (-0.0096)	0.0020 (0.0050)

Table 6: Marginal Effects and Quasi Elasticities Obtained From the Estimated MNL Model

Source: Author's Computation from Field Survey, 2019. Values in Parenthesis Are the Quasi Elasticities, \*\*\*, \*\* and \* Indicate 1%, 5% and 10% Levels of Significance Respectively

## 4. Conclusion

The focus of this study was to analyze rural livelihoods to investigate factors determining the choice of rural livelihoods among farming households in Southwestern Nigeria. Based on the descriptive and inferential statistical analysis, the study found that agriculture, including crop and livestock husbandry, was the dominant income-generating activity in the study area. Most farming households were male-headed, with an average farm holding of about 3 hectares. The choice of on-farm livelihood was pursued by less than 5% of the sampled households. In contrast, On-farm\_Off\_farm-Non\_farm livelihoods were found to be mostly pursued, particularly among the socio-economically disadvantaged

households with little or no access to formal education, credit, and cultivable land. This study concludes that farm size increased the probability of specializing in on-farm livelihood, while age, dependency ratio, and market distance reduced it.

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