



## Effects of Off-farm Income on Poverty and Food Security Status of Farmers in Paikoro Area of Niger State, Nigeria

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### Authors' contributions

This work was carried out in collaboration among all authors. Author ESY designed the study, performed the statistical analyses, wrote the protocol and wrote the first draft of the manuscript. Authors AA and COA managed the analyses of the study, literature searches and edited the manuscript. Author IIO participated in data collection and processing. All authors read and approved the final manuscript.

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### ABSTRACT

This study determined the effects of off-farm income on poverty and food security status of farmers in Paikoro Local Government area of Niger state, Nigeria. A total of 150 farmers were selected randomly from six wards across the Local Government Area. Structured questionnaire and interview schedule were used to elicit primary data from the farmers for the study. Descriptive statistics, Foster-Greer-Thorbeck (FGT) model, Logit regression and Tobit regression models were used for data analysis. Results showed that the mean age of the farmers was 42 years, majority (89.33%) were male while 90.67% were married and 63% had no formal education. The most prevailing off-farm enterprise was trading (74%). The poverty status of the respondents were classified under poor and non-poor with poverty incidence of 41.33% for the poor, poverty gap and severity indices were 37.63% and 14.16% respectively. Logit regression showed membership of association, household size, gender, food expenses, years in formal education, and off-farm income were significant at  $p=0.01$ ,  $p=0.01$ ,  $p=0.05$ ,  $p=0.05$ ,  $p=0.05$ ,  $p=0.05$  respectively. The food

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security status analysis revealed that 67% of the farmers were food secure while 33% were food insecure. Tobit regression results showed household size, farming experience, size of farm and off-farm income at  $p=0.01$  respectively were significant determinants of food security. It was concluded that off-farm income had significant positive effect on the poverty and food security status of the farmers. However, poverty and food insecurity still remain major issues in the area that cannot be over-looked, and as such, efforts should be made to ensure that farmers are encouraged and empowered to engage in profitable off-farm activities while the government should also make policies that will favour their off-farm enterprises.

*Keywords: Off-farm income; poverty; food security; farmers; Paikoro and Niger State.*

## 1. INTRODUCTION

Agriculture is generally the pillar of the people living in the rural areas and as such farming is the main occupation engaged by people in the rural areas. Farmers in their quest for avenues to generate income to meet their needs often engage in off-farm activities to generate more income for their household. Off-farm income of farming households refers to any source of income which is generated through non-agricultural activities. Off-farm activities have undoubtedly become an important component of livelihood strategies and diversification among rural households [1]. According to Babatunde et al. [2], off-farm income contributes to higher food production and farm income by easing the stress on capital investments, thereby, improving rural farming household welfare in many ways. It is therefore imperative to analyse the concept of food security and poverty status as it is affected by various off-farm income generating activities, since fighting poverty and food insecurity are major challenges in the society.

Omeje et al. [3] defined food security as the state achieved when food systems operate in such a way that all people, at all times, have physical and economic access to sufficient, harmless and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Therefore, given the pivotal role of agriculture in the Nigerian economy, food insecurity could obviously be attributed to the poor performance of the agricultural sector which creates problems of food availability and accessibility both at the household and national levels. The poor performance of the sector directly creates food supply shortages and indirectly also creates demand shortages by denying the household access to sufficient income. More so, Obayelu [4] had opined that food insecurity could also be attributed to low level of the average quantity of food crop produced, sales and consumption of

the greater part of their farm produce immediately after harvest and the prevalence of the polygamous lifestyle. According to Mwabu [5], over 50% of African population lives below the international subsistence standard of one dollar per day. And also a large population is at risk of suffering a reduction in their current standard of living irrespective of their current poverty status. The food insecurity situation in Nigeria has however become worsen with the passage of time due to the wide gap between the national supply and the demand for food [6].

Babatunde et al. [7] reported that off-farm income enhanced food security and nutrition of the rural households in Kwara State. Different studies have further reported an increasing share of off-farm income in total household income, and in Nigeria, it has been observed that off-farm incomes represent an important element in the livelihood of the poor in rural areas [8]. The most common off-farm activities undertaken by farmers include trading, artisanship, commercial motorcycling and working in the civil service among others. Since there are inefficiencies in sustaining higher level of food production, most especially in the rural areas, farmers' have developed quest for avenues to generate income to meet their needs. Therefore they engage in off-farm activities to generate more income for their household. However, only a little or no research evidence is available of efforts to investigate the effect of income generated from off-farm enterprises by the farmers on their poverty and food security status especially in Paikoro Local Government Area of Niger State. This study therefore sought to reveal the inducing effect of off-farm income on food security and poverty status of farmers in the study area. Specifically, it sought to describe the socio-economic profile of the farmers, identify the prevailing off-farm income generating enterprises and determine the effects of off-farm income on

poverty and food security status of the rural farming household.

## 2. METHODOLOGY

The study was conducted in Paikoro Local Government Area (LGA) of Niger State, Nigeria. Paikoro LGA has headquarters in a town called Paiko which is about 25 km south of the state capital Minna. The local government has an area of 2,066 km<sup>2</sup> with a projected population of 218,828 as of 2017 going by the annual population growth rate of 2.50% in Nigeria [9]. It is located on Latitude 9°26'N and Longitude 6°38'E. The major agricultural activities people engaged in are farming fishing and livestock rearing. The map of Nigeria showing the study area is presented in Fig. 1.

A two-stage sampling procedure was used to select respondents for the study. In the first stage, six wards were randomly selected from Paikoro LGA. The second stage involved the random selection of 25 farmers from each of the six wards to give a sample size of 150 respondents.

The primary data were utilized for this study. The primary data were obtained through a structured questionnaire and interview schedule.

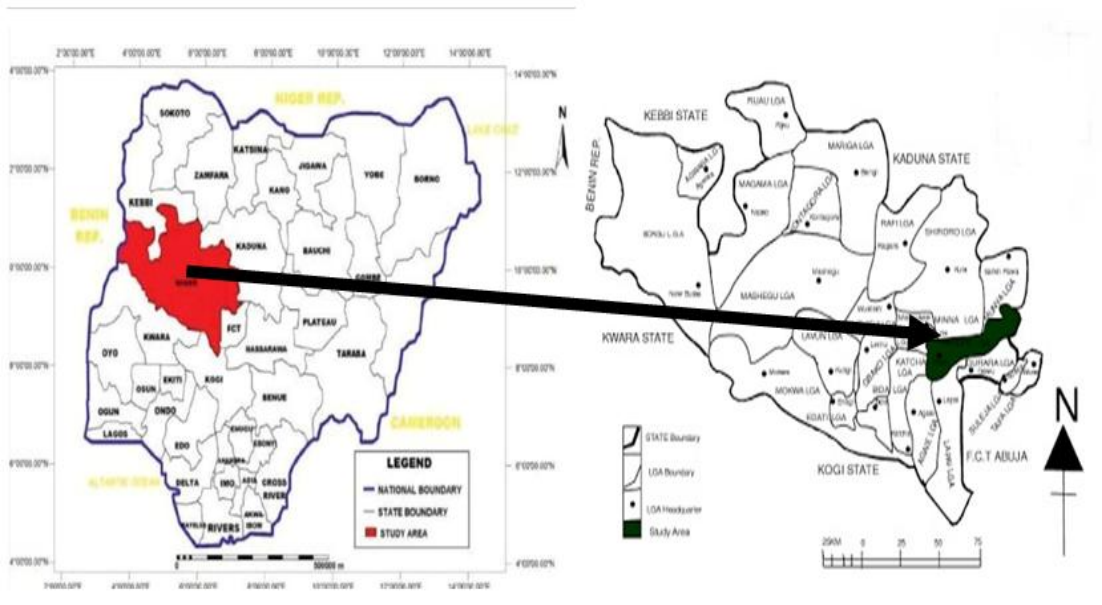
Various analytical tools such as descriptive statistics, logit regression model, Foster-Greer and Thorbecke (FGT) index model, food security index formula and tobit regression model were used for data analysis.

Poverty indices were computed using the Foster et al. [10] model to measure the incidence, depth and severity of poverty among farmers in the study area. The FGT model adopted from Sallawu et al. [11] and Yisa et al. [12] is specified mathematically in equation (1).

$$P_a = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^\alpha \quad (1)$$

Where:

- $P_a$  = poverty index of the farmers
- $Z$  = poverty line value ( $\frac{2}{3}$  of mean annual household per capita expenditure)
- $N$  = total number of farmers in the reference population
- $q$  = the number of poor (below the poverty line)
- $y_i$  = expenditure of the poor groups of persons
- $\alpha$  = is a parameter which measures the incidence, depth and severity of poverty respectively, with the values of 0, 1 and 2 as indicators of the poverty status of farmers.



Map 1. Map of Nigeria showing the study area

The Logit is a non-linear regression tool used in modelling dichotomous outcome variables. The model as specified in equation (2) was used to analyse the effect of off-farm income on poverty status of the study area.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu \quad (2)$$

Where;

Y = Poverty status, (1=poor, 0=Non-poor)

$\beta_0$  = Intercept,

$\beta_1 - \beta_{10}$  = coefficients

$X_1$  = Off-farm per capita monthly income (Naira)

$X_2$  = Gender (Male=1, Female=0)

$X_3$  = Age (number of years),

$X_4$  = Household size (no. of persons)

$X_5$  = Education status (no. of years spent in school)

$X_6$  = Size of farmland (Ha)

$X_7$  = Farming Experience (years)

$X_8$  = Food expenses (₦)

$X_9$  = Access to extension agent (1=yes, 0=No)

$X_{10}$  = Membership of association

$\mu$  = Random error term

The farm households in the study area were classified into two groups; Food secure and Food insecure households using food security index ( $F_i$ ), which establishes the food security status of various household following Adejobi et al. [13]. Households whose per capita monthly income falls below two-third of the mean monthly per capita food expenditure will be noted as food insecure and also households whose per capita monthly food expenditure falls above or equal to two-third of the mean per capita expenditure will be noted to be food secured. Mathematically it is expressed in equation (3) as:

$$F_i = \frac{\text{per capita food expenditure of } i\text{th household}}{\frac{2}{3} \text{ mean per capita food expenditure of all household}} \quad (3)$$

Where;

$F_i$  = food security index

$F_i \geq 1$  = food secure household

$F_i < 1$  = food insecure household

Tobit model was used to analyse the effect of off-farm income on the food security of household in the study area. This was expressed as given in equation (4).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \mu \quad (4)$$

Where;

Y = Poverty status, (1= food secure, 0 = food insecure)

$X_1$  = Off-farm monthly income (₦)

$X_2$  = Gender (1=Male, 0=Female)

$X_3$  = Age of household (years),

$X_4$  = Household size,

$X_5$  = Farming experience (years)

$X_6$  = Size of farmland (Ha)

$X_7$  = Farm income (₦)

$X_8$  = Membership of association (Yes=1, No=0)

$X_9$  = Access to extension agent (Yes=1, No=0)

$\beta_1 - \beta_9$  = coefficients

### 3. RESULTS AND DISCUSSION

#### 3.1 Socio-economic Profile of the Farmers

The socioeconomic profile of the farmers is presented in Table 1. It showed that approximately 98% of the respondents were males while 2% were females. This finding suggests that farming activities in the area is continually being dominated by the male. This is similar to the findings of Sallawu et al. [14] and Ogaji et al. [15] who reported respectively that 95.5% and 86.70% of farmers in separate studies conducted in Niger State were males. The analysis of the age of the farmers in the area revealed that 71.3% of the respondents fall within the age bracket of 21-50 while a few (12%) were above 60 years. An average farmer was 42 years old which implies that majority of them were in their active and productive age. The result further shows that 90.67% of the farmers were married while 9.33% were single. The average household size of farmers in the study area was about 14 members. This implies that high percentage of households in the study area have large household size, and as such, certain proportion of their income from both off-farm income and farm income will be required on these members to cater for their welfare.

Also, as presented in Fig. 1, about 63% had no form of formal education while 22% and 9% of them had secondary and primary education respectively. This finding indicates that majority of the farmers in the area have low literacy level. This finding lends credence to the report of Awoniyi and Salman [16] that the level of education among the rural farming households in Nigeria is low and this has implications on their income-earning capacity. The result in Fig. 2

shows the distribution of the off-farm enterprises undertaken by the respondents. It revealed that about 85.33% engages in trading which was the most prevailing off-farm enterprise in the area. While 22.67% constituted off-farm enterprises like; fishing, hunting, handcraft, civil servant, artisan, security guard, construction worker, tailor, driver and village head. This implies that most people in are involved in trading commodities. This is in agreement with the argument of Ojeleye et al. [17] that the most common off-farm activities undertaken by farmers are; trading, commercial motorcycling and working in the civil service.

### 3.2 Poverty Status of Farmers in Paikoro LGA of Niger State

The result of the analysis of the farmers' poverty status presented in Table 2 shows the estimated poverty line to be \$370.20. The poverty line was determined by computing  $\frac{2}{3}$  of mean annual household per capita expenditure of the farmers. According to Foster et al. [18], the proportion of households with consumption per capita less than the poverty line are categorized as poor and vice versa. On this basis, farmers in the area with an annual per capita expenditure of \$370.20 or more were considered to be non-poor, while those with annual per capita expenditure below \$370.20 where considered to be poor. Table 2

also shows poverty indices of farming household in the study area. It shows that 58.67% of the respondents were non-poor or rich, 41.33% of the respondents were poor. This indicates that a greater percentage of the respondents in the study area were non-poor. This finding is similar to that of Sallawu et al. [19] who reported that majority of the farming households in Niger State Nigeria were not poor.

Results from the FGT model showed that poverty incidence ( $p_0$ ) was 0.4133 which implies that 41.33% of farm households had expenditure below the poverty line and were therefore categorized as poor. The poverty gap index ( $p_1$ ) was 0.3763 which implies that 37.63% of expenditure, that is, \$139.26 annual household per capita expenditure is required to bring poor households out of poverty, at least to the poverty line. Poverty severity index ( $p_2$ ) was 0.1416. Furthermore, the core poor were 14.16% worse compared to averagely poor and will have to mobilize financial resources up to 14.16% more of \$370.20 household per capita expenditure annually than that required for the averagely poor. The recorded poverty gap and severity indices of 0.3763 and 0.1416 respectively are relatively lower than the poverty gap index of 0.67 and poverty severity index of 0.45 reported by Yisa et al. [20] for farmers in Shiroro Local Government Area of Niger State.

**Table 1. Distribution of farmers according to socio-economic characteristics**

Variable	Frequency	Percentage	Mean
<b>Gender</b>			
Male	138	92.00	
Female	12	8.00	
<b>Age (years)</b>			42.00
Less than 20	3	2.00	
21 – 30	27	18.00	
31 – 40	50	33.30	
41 – 50	30	20.00	
51 – 60	22	14.67	
Above 60	18	12.00	
<b>Marital Status</b>			
Married	136	90.67	
Singled	14	9.33	
<b>Household size</b>			14.00
1 – 5	11	7.33	
6 – 10	46	30.67	
11 – 15	47	31.33	
16 – 20	35	23.33	
Above 20	11	7.33	

Source: Field Survey, 2017

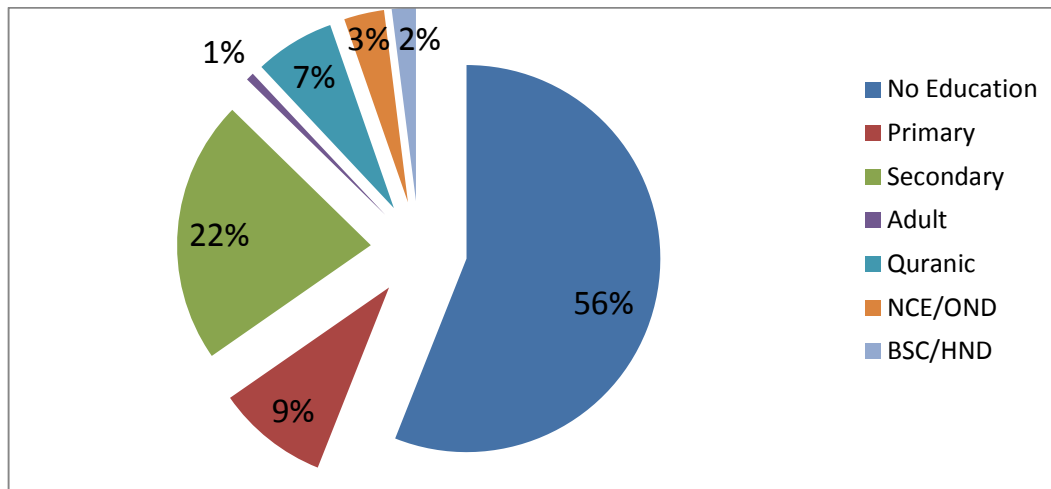


Fig. 1. Distribution of farmers according to educational level

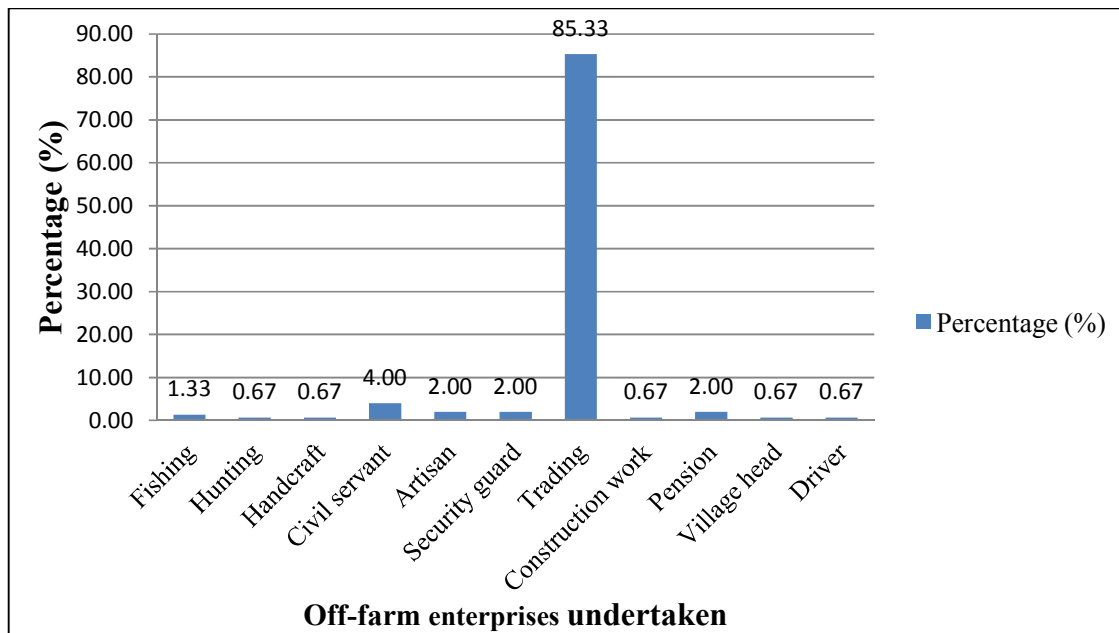


Fig. 2. Distribution of farmers according to off-farm enterprises undertaken

Table 2. Poverty indices of respondents in the study area

Poverty status	Indices	Frequency	Percentage (%)
Poor		62	41.33
Non-poor		88	58.67
Poverty gap ( $P_1$ )	0.1416		
Poverty severity ( $P_2$ )	0.0669		
Poverty incidence ( $P_0$ )	0.4133		

Poverty line (2/3 of mean annual household per capita expenditure) = \$370.20

Exchange rate: \$1 = ₦359.99

Source: Field Survey, 2017

### 3.3 Factors Influencing Respondents' Poverty Status in Paikoro LGA of Niger State

The estimates logit regression model of the effect of off-farm income on the poverty status of farmers in the study area is presented in Table 3. The regression analysis result shows that the LR-Chi-square value of 67.93 was significant at  $p=0.01$  probability level which implies that there is a significant relationship between the dependent and independent variables in the model. The result indicated that off-farm income was significant at  $p=0.05$  probability level. The implication of this is that the likelihood of reducing poverty incidence among the farmers in the area will increase with increase in their level of off-farm income. This shows that off-farm income had a positive and significant effect on the poverty status of the farmers. This finding is similar to those of Omotayo [21] and Keeney and O'Brien [22] who reported that off-farm income had significant positive effect on poverty reduction in rural farm households in Nigeria and Ireland respectively. Furthermore, the result revealed that the coefficient of other variables; gender at  $p=0.05$ , years spent in formal education at  $p=0.10$  and food expenses at  $p=0.05$  probability level were positively significant. While Household size at  $p=0.10$  and member of association at  $p=0.01$  probability level were both negatively significant respectively. This finding is in agreement with the findings of Omotayo [23] who reported that household size, years of formal education are among

significant factors influencing the poverty status of farming households in Ekiti State. The positive coefficient values indicate that a higher value of the variable will tend to increase the likelihood of being poor while the negative values decrease the probability of being poor.

Furthermore, the result presented in Table 4 contains the value of estimated marginal effect and elasticity calculated for the significant variables. The significant variables affect the probability of poverty status among farmers. The marginal effect on gender, years in formal education and food expenses were elastic. This implies that one percentage change in these explanatory variables leads to a more than proportionate change in poverty status. The inelastic variables (household size, off-farm income and member of association) suggest that the variables lead to a less than proportionate change in poverty status.

### 3.4 Food Security Status of Farmers in Paikoro LGA of Niger State

The result presented in Fig. 3 shows the distribution of respondents according to their food security status. It revealed that 67.00% of the farmers were food secure while 33.00% were food insecure. This implies that majority of the farmers were food secure. This result is relatively higher than the 53.64% food secure reported by Jabo et al. [24] for rural farm households in Nigeria.

**Table 3. Determinants of poverty status of the respondents**

Variable	Odds ratio	Std error	Z-value
Constant	0.0031	1.8328	-3.15***
Off-farm income	1.0000	7.23e-06	2.14**
Gender	30.2608	1.3418	2.54**
Age	1.0240	0.0266	0.89
Household size	0.9215	0.0455	-1.80*
Years in formal education	0.9215	0.0629	1.98**
Size of farmland	0.9645	0.0629	-0.58
Farming experience	1.0438	0.0304	1.41
Food expenses	1.0000	0.00002	2.00**
Access to extension agent	2.2334	0.6084	1.32
Member of association	0.2197	0.5206	-2.91***
<b>Diagnostic statistics</b>			
LR-Chi-square	67.93***		
Log likelihood	-58.2595		

\*=significant at 10%, \*\*=significant at 5%, \*\*\*=significant at 1% probability levels

Source: Field Survey, 2017

### 3.5 Determinants of Food Security Status in Paikoro LGA of Niger State

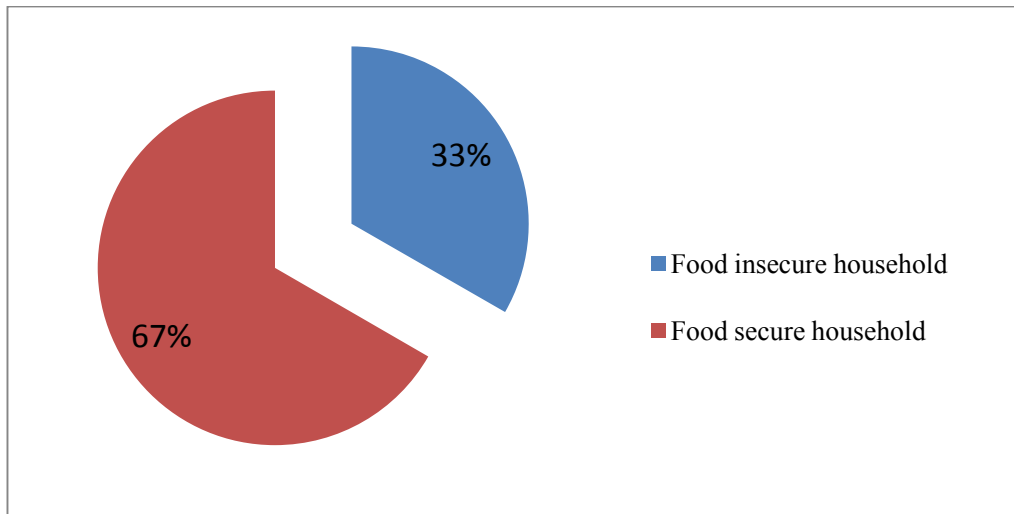
The result of Tobit regression model showing the effect of off-farm income on food security status of rural farming household in the study area is

presented in Table 5. The regression analysis result shows that the LR-Chi-square value of 118.02 was significant at  $p=0.01$  probability level which implies that there is a significant relationship between the dependent and independent variables in the model. The

**Table 4. Estimates of marginal effect and partial elasticity of effects of off-farm income on poverty status of respondents**

Variables	dy/dx (marginal effect)	ey/ex (elasticities)
Gender	3.40985	5.4719
Household size	-0.8135	-1.9802
Years in formal education	0.1031	1.0915
Food expenses	0.0004	3.0348
Member of association	-1.5153	-1.1950
Off-farm income	0.0001	-1.4259

Source: Field Survey, 2017



**Fig. 3. Food security status of respondents**

**Table 5. Determinant of food security status of respondents**

Variable	Coefficient	Std error	t-value
Constant	0.5139	0.2924	1.76*
Off-farm income	5.97e-06	1.46e-06	4.10***
Gender	0.0366	0.2031	0.18
Age	-0.0057	0.0067	-0.85
Household size	-0.2423	0.0082	-2.95***
Farming experience	0.0234	0.0071	3.30***
Size of farmland	0.0473	0.0151	3.14***
Farm income	5.50e-07	4.70e-07	1.17
Membership of association	0.1331	0.1161	1.15
Access to extension agent	-0.1105	0.1366	-0.81
<b>Diagnostic statistics</b>			
LR Chi-square	118.02***		
Log likelihood	-155.61876		

\* = significant at 10%, \*\* = significant at 5%, \*\*\* = significant at 1% probability levels

Source: Field Survey, 2017



estimated coefficient of off-farm income which shows its causal effect on food security among the farmers was positively significant at  $p=0.01$  probability level. This suggests that the probability of the farmers being food secure increases with increase in off-farm income generation. The implication of this result is that off-farm income had a positive effect on the food security of the farmers in Paikoro LGA of Niger State. This finding is in agreement with that of Babatunde and Qaim [25] that off-farm income has a positive net effect on food security and nutrition in Nigeria. The result further revealed that farming experience at  $p=0.01$ , size of farmland at  $p=0.01$  and off-farm income at  $p=0.01$  probability level were positively significant. Conversely, the coefficient of household size at  $p=0.01$  probability level was negatively significant. The positive value coefficient indicates that a higher value of the variable tends to increase the likelihood of being food secured while the negative value decreases the likelihood of being food secured. The variables farming experience and size of farmland have a positive coefficient which implies that as they increase, the probability of food security increases accordingly. Household size has a negative coefficient which implies that as household sizes increases, the probability of food security decreases.

#### 4. CONCLUSION

This study found that off-farm income significantly affected both the poverty and food security status of farmers in the study area. It revealed that 41.33% of them were poor and 33% were food insecure. This may not be unconnected with the fact that, although farmers were engaged in various off-farm activities, the off-farm activities engaged by most of them were not lucrative enough to completely alleviate poverty and enhance food security. Poverty and food insecurity still remains major issues in our society that cannot be over-look. Therefore, efforts should be made to ensure that farmers are well enlightened and encouraged through extension service delivery to diversify their livelihood and engage in productive off-farm activities. The government should provide effective and stable enabling environment where off-farm enterprises can be undertaken by the rural poor and thrive.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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