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DIVERSIFICATION OF LIVELIHOOD AND FOOD SECURITY NEXUS AMONG RURAL HOUSEHOLDS IN ONDO STATE, NIGERIA

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Abstract

Despite the tremendous contribution of rural households to Nigeria's economy, they are still described by food insecurity, hence the need to revamp the livelihood of the people for sustainable food security and rural development. Therefore, the study assessed the nexus between the livelihood's diversification and food security of the rural households in Ondo State, Nigeria. Data were collected from 120 rural household heads using well-structured questionnaire. Data collected were analysed using descriptive statistics, food security index, and probit regression model. The results revealed that 80.8% of the respondents were male, 82.5% were married and majority (83%) of them had at least primary school education. The primary occupation was farming and 73.3% of the respondents were observed to combine both farm and non-farm activities. Petty trading, civil service, commercial motorcycling, welding, tailoring, lumbering, among others were observed to be the common non-farm income sources adopted by households in the study area. The mean per capita food expenditure (MPCFE) for the food secure and food insecure households were ₦5,820.00 and ₦2,119.50, respectively with a bench mark of ₦3,005.68. The results of the food security index showed that about 67.5% and 32.5% of the respondents were food secure and food insecure with index of 1.94 and 0.71, respectively. The results of probit regression showed that marital status, household size and number of income sources significantly influenced household food security status in the study area. The conclusion drawn from the study was that, diversification of livelihood is a pursuit that enables rural households to attain a secured food status.

KEYWORDS: Food Security, Livelihood, Probit model, Rural, Households, Nigeria

Introduction

Food is fundamental to the growth of an individual. Access to adequate standard of living which includes food security is acknowledged in the universal declaration of human right (Ahmed *et al*., 2015). Food quantity and quality affect the health and economic well-being of households. The significant impact of the quality and quantity of food consumed is evident on the general level of economic activities and productivity obtained in a nation. Therefore, it is the top-most priority of every nation to ensure that its citizens are food secure.

By definition, food security exists when all people, at all times have, physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, IFAD and WFP, 2013). The above definition nails down four dimensions of food security, which are availability, accessibility, utilisation and sustainability. Availability connotes with the physical presence of a large quantity of food, accessibility implies that there is the ability to acquire the required quantity; utilization/adequacy means sufficiency in both quantity and quality of

food; and sustainability implies access at all times and not losing such access (Omonona and Agoi, 2007).

Food security in Africa has come under extremely threats due to some factors some of which are natural while some are artificial depending on the circumstances and the countries involved. Many of Africa countries do experience food insecurity problems with food supplies being inadequate to maintain their citizens' per capita consumption (Shala and Stacey, 2012). They also discovered that sub-Saharan Africa was the most vulnerable region with regards to the problem of food insecurity. The average amount of food available per person per day in sub-Saharan Africa was 1,300 calories which was about 48% of the world wide average calories (Ahmed *et al.,* 2015). Again, so many factors are responsible for the food insecurity in the region. One of the identified causes is drought which is putting strain on food safety nets and international food aid programmes. Also, political instability is threatening food security in almost every region of the continent (GFSI, 2017), and Nigeria has its own share of these crises. The nation has in recent time experienced crisis between farmers and Fulani herdsmen, inter-communal clashes to include insurgency and terrorist attacks which have led to the displacement of farming households from their home and the destruction of farmlands.

Moreover, the World Food Programme (WFP, 2018) estimated that around 110 million Nigerians representing 60 percent of the total population, lives below the poverty line. Poverty is especially pronounced in rural areas where 80 percent of the population lives below the poverty line. The linkage between poverty and food access signifies the prevalence of food insecurity problems in rural Nigeria. Again, the Global Food Security Index (GFSI, 2017) assessed 113 countries in all. Nigeria ranked 92nd with 38.4 score based on the indices of affordability (accessibility), availability, quality, safety and natural resources and resilience. The natural resource and resilience indicator is newly included in the global food security indices to measure the impact of resource risk on food security (GSFI, 2017). With the inclusion of this indicator, no country performed better in terms of its overall food security score. This is likely due to diminishing stock of natural resources base due to over-use as a result of large population growth and the need for infrastructural development. The fast depletion of the natural resource base which at most times is not in favour of food production.

However, concomitant efforts have been in place by successive government in Nigeria to improve agriculture. The role of agriculture in the development and growth of Nigeria's economy is primarily indicated in its contributions to the food supply and generation of employment to about 70% of its populace having agriculture as their major livelihood (Azubike, 2012). Some of the efforts of government to end food security problems are the establishment of several agricultural development institutions, special programmes and projects which are also domiciled in the study area (Ondo State). Among which are: The National Agricultural Development Fund [NADF] in 2002; National Special Programme on Food Security [NSPFS] in 2002;Commodity Marketing and Development Companies, CMDC (2003), National Fadama Development Project, NFDP I,II, and III (1992, 1999 and 2008 respectively); Nigeria Agricultural Cooperative and Rural Development Bank, NACRDB (2000); National Food Crisis Response program [NFCRP], Food Security Thematic Group [FSTG] in 2009, and the immediate past administration's Growth Enhancement Support [GES] under the Agricultural Transformation Agenda [ATA] in 2011. The empirical records of many of these government initiatives are not impressive enough to have achieved the objectives for which they were initiated, leaving an overwhelmingly large proportion of Nigerians food insecure (Idachaba, 2004; Adepoju and Adejare, 2013); while some lack implementation and continuity as a result of change in government coupled with corruption in the system of administration of government programmes and projects.

Also, the slow growth of agriculture and food production has resulted in growing food imports and food security issues in the country (Ahmed *et al.*, 2015). With majority of Nigerians residing in rural areas, rural Nigeria are characterized as agrarian livelihood with about two–thirds engaged in crop and livestock production as well as other primary production activities for their own use and market sales. With non-appreciable yield on agricultural investment especially for rural dwellers, the livelihood base has been described as having a higher level of poverty than other occupational groups in rural Nigeria. Rural agriculture is subjected to local variations in weather conditions, and thus expected variations in income levels and thus access to food (Omonona, 2009).

The inadequacy of farming to meet the food need of rural households makes them to take up other income generating activities mostly non-farm activities as supplementary or secondary livelihood source to sustain their family. It has been the traditional image of farm households in Ondo State and Nigeria as a whole, that they focus almost exclusively on farming and at the same time undertake little rural non-farm economic activities (Reardon, Bergue, Barret and Stamoulis, 2006; Amurtiya, 2015). These activities include among others trading, hairdressing/barbing, craftwork, tailoring etc.

A key issue in food security campaign is livelihood and income diversification potential of households. In fact, it may be noted that treating the issue of food security without consideration of the attendant security of the livelihoods of the individual/household in question may be inadequate to making appropriate policy recommendations (Oni and Fashogbon, 2012). Sustainable livelihood approach to food security concerns itself with economic access to food by household other than the physical presence of food. Therefore, the understanding of the strategies adopted by the rural households to ensure sustainable livelihood and hence food security is important for agricultural research and development. As it is important to understand the dynamism of rural livelihood strategies and how rural households develop their own strategies accordingly. Again, several studies have been carried out separately on food security and livelihood diversification but little or no attention have been geared toward how livelihood sources affect the food security status of the rural people. Against this background that the study sought to address food security issues from the perspective of sustainable livelihood sources among rural households in Ondo State rather than it been treated as a stand-alone concept. That is, equating food security to livelihood strategy. Therefore, the specific objectives of the study are to:

1. identify the socio-economic characteristics of the respondents;
2. estimate the extent of food security status of households in the study area; and
3. determine the effect of diverse livelihood sources on rural household's food security status.

Methodology
Study area
The study was carried out in Ondo State. The State is located between longitudes 4^0 15^1 E and 6^0 00^1E of the Greenwich meridian and latitudes 5^0 45^1N and 7^0 45^1N which is the North of the equator in the South-western Nigeria (Igbalajobi *et al*., 2013). Its land area covers about 15,500 square kilometres. The climate of Ondo State is of the lowland tropical rain forest type, with distinct wet and dry seasons. Ondo State shares boundary with Edo and Delta States to the east, Ogun and Osun States to the west, Ekiti and Kogi States to the north and the Bight of Benin and the Atlantic Ocean to the south. The State is favourably blessed with varied ecological and climatological conditions. Its vegetation ranges from mangrove swamps of the southern coastal riverine areas through the rainforest of the midlands to the derived savannah in the northern part of the State (Daramola *et al*., 2010). Ondo State is divided into 18 administrative Local Government Areas (LGAs) with population estimate of 3,441,024 (NPC, 2006). These Local Governments are classified under a broad umbrella of three senatorial districts and each district is made up of six LGAs. Agriculture is a prominent economic activity in Ondo state and a large number of its population are engaged in small scale farming with the cultivation of major arable crops which includes maize, cassava, yam, cowpea, and sorghum while cocoa, kolanut, oil palm, cashew, rubber among others are the major tree crops cultivated. Agricultural production is mostly subsistent with little or none for sale. In addition to farming and fishing, the inhabitants are also engaged in other occupations such as trading, manufacturing, commerce and civil service. Ondo State is equally blessed with extensive deposits of natural resources among which are crude oil, bitumen, glass sand, kaolin, granites and limestone.

Data collection and sampling technique
Data used for this study were primarily collected through direct personal interview with a well-structured questionnaire. A three-stage sampling procedure was used to select the respondents. Firstly, three Local Government Areas (LGAs) were purposively selected from the State based on their rural classification and preponderance in farming activities. These LGAs were: Owo, Odigbo and Ifedore. The second stage involved simple random

sampling technique to select two (2) rural communities from each LGA to make a total of six (6) rural communities. Finally, twenty (20) households were also randomly selected from each of the six (6) rural communities. Therefore, a total of forty (40) respondents from each LGA that equaled one hundred and twenty (120) households constitute the sample size for the research**.**

Analytical procedure
Descriptive statistics such as mean and percentages were used to examine the socio-economic characteristics of the respondents. Food Security Index was used to analyse the food security status of the respondents, while probit model was used to determine the effect of diverse livelihood sources as well as other factors on the food security status of rural households.

The food security index
This study adopts the consumption based or expenditure approach to classify the respondents into food secure and food insecure households respectively. This indicator is traditionally used with shares of household income spent on food leveraged as a proxy variable (Pinstrup-Anderson, 2009; De Weerdt *et al.*, 2014). The measure goes beyond household food access as it describes the importance households place on food by the share of their income they are ready and willing to spend on food. This indicator considers household food acquisition and allocation behaviour (Mensah, 2014).
The food security index is explicitly stated as follow:
$$FSi = \frac{Per\ capita\ food\ expenditure\ for\ the\ ith\ household}{\frac{2}{3}\ mean\ per\ capita\ food\ expenditure\ of\ all\ households} \quad (1)$$
Where,
FSi = food security index
Construction of food security line:
$$Per\ capita\ food\ expenditure\ (PCE) = \frac{share\ of\ income\ spent\ on\ food}{Household\ size} \quad (2)$$
$$Total\ per\ capita\ food\ expenditure\ (TPCE) = Summation\ of\ PCE \quad (3)$$
$$Mean\ Total\ Per\ Capita\ Expenditure\ (MTPCE) = \frac{TPCE}{Total\ number\ of\ households} \quad (4)$$
$Food\ Security\ Line = \frac{2}{3}\ of\ \text{MTPCE}$
$PCE \geq \frac{2}{3}\ of\ MTPCE$; Implies that $FSi \geq 1$= food secure *ith* household
$PCE < \frac{2}{3}\ of\ MTPCE$; Implies that $FSi < 1$= food insecure *ith* household.

Therefore, a household with per capita monthly food expenditure above or equal to two-third of the mean per capita food expenditure is food secure while a household with per capita food expenditure below two-third of the mean monthly per capita food expenditure is food insecure.
The study further estimated other indices such as food insecurity gap (FIG), headcount ratio (HCR) and Surplus Index (SI) using the food security index estimated.
Food Insecurity gap is shown in the equation below:
$$\frac{1}{M}\sum_{i=1}^{n} G_i$$
Where,
M=Number of food insecure households;
G_i = Expenditure deficiency for the ith households.
G_i was further expanded in a form:
$$G_i = \left(\frac{R - Yi}{R}\right)$$
Where,
Y_i= Actual amount spent on food by the *ith* household*;*
$R = \frac{2}{3}\ of\ MTPCE$
The headcount ratio (HCR) is given as:
$$HCR = \frac{M}{N} \times 100\% \quad (8)$$
Where,
N=Number of households in the sample.
The Surplus Index (SI) is given by:
$$\frac{1}{M}\sum_{I=1}^{n} \left(\frac{Yi - R}{R}\right) \quad (1)$$

The Probit model
Probit model is a model used in estimating the probability of events based on dependent dichotomous variable (Gujarati and Porter, 2009). It constrains the estimated probabilities to be between 0 and 1, and relaxes the constraint that the effect of independent variables is constant across different predicted values of the dependent variable (Nagler, 1994). This model has found several applications in the literature (Oluyole *et al.*, 2009; Igbalajobi *et al.*, 2013). The dichotomous dependent variable in this case is food security status which assumes only two values one for food secure and otherwise zero. (5)
The probit model to be estimated as adapted from Igbalajobi *et al.* (2013) is given as:

$$P\left[Yt = \frac{1}{x_i}\right]$$

$$= \frac{\exp(x_i\beta)}{1 + \exp(x_i\beta)} \tag{10}$$

This is equivalent to:

$$\frac{exp(x_ib)}{1 + \exp(x_ib)}$$

$$= \frac{1}{1 + \exp(x_ib)} \tag{11}$$

This is further expressed as:

$$q_{it}$$
$$= bx_{it}$$
$$+ e_{it} \tag{12}$$

The probability that the dependent variable assumes the value 1 implies:

$$Prob.(q_{it} = 1)$$

$$= \frac{e^{xit} + \beta^{xit}}{1 + e^{xit} + \beta^{xit}} \tag{13}$$

Where,

Y_t = dichotomous dependent variable (food secure or otherwise)

q_{it} = An unobservable latent variable for food secure households

x_{it} = vector of explanatory variables

b = vector of parameter to be estimated

e_{it} = error term

The explanatory variables are stated as follow:

X_1 = Age of the respondents (in years);

X_2 = Gender of household head (male = 1, 0 if otherwise);

X_3 = Marital status (married = 1, 0 if otherwise);

X_4 = Level of Formal Education (educated =1, 0 if otherwise);

X_5 = Primary occupation of household head (farming = 1, 0 if otherwise);

X_6 = Living in own house (yes = 1, 0 if otherwise);

X_7 = Household size (number);

X_8 = Total household monthly income (₦);

X_9= Total expenditure on non-food items ((₦);

X_{10}= Farm size (Ha);

X_{11} = Access to remittances (Yes=1; If otherwise=0);

X_{12} = Access to training on livelihood strategies (Yes=1, If otherwise=0);

X_{13}= Income sources (numbers)

Results and Discussion
Socio-economic characteristics

Socio-economic characteristics are very important as they indicate the economic and social position of a person. The socio-economic characteristics collected in the survey were age, marital status, major occupation, gender, household size, educational level, farm size and household monthly income. The findings revealed that majority of the respondents (38.3%) were aged between 40 and 49 years old, followed closely by 30-39 age range with 26.7%, the lowest proportion of the respondents (6.7%) were aged between 20 and 29, while the mean age of respondents from the study was 44.58 years old. This is an indication that, respondents are economically active and energetic to engage in multiple income generating activities that will positively influence their food security status. It has been established by (Dary and Kuunibe, 2012) that age affect the ability of households to diverse their livelihood income activities, which in turn, affects household's productivity and general well-being. The pattern of gender distribution of household head from the survey revealed that 80.8% of the respondents had their households headed by male while 19.2% were female headed households. Nigeria rural society is a patriarchy in nature (Lawson, 2010) with the male dominating as household heads and is saddled with the responsibility to cater for the welfare of the family. This finding is in agrees with that of Oluwatayo (2012) who found out that rural Nigeria comprises more male-headed households than female-headed households. Several studies (Oluyole *et al.*, 2009; Adepoju and Adejare, 2013; Amurtiya, 2015 and Ahmed *et al.*, 2015) have asserted that household size affects household food security status. The results of this study show that majority (48.3%) of the respondents had household size of 4-6 persons, followed by 30% of the respondents which had household size of 7-9 persons while only 5.0% of the respondents had household size of 10 persons and above. The mean household size was 5 persons which are moderate enough compared to the rural national household size average of about 6 persons (NBS, 2016). According to Kurwornu *et al.* (2013) being married indicates the complimentary efforts of both parents which may positively influence the food security status of their households. From the sampled respondents, majority (82.5%) of the respondents were married, 10.8% of them were single and about 6.7% were widowed. The responsibility that comes with marriage may also necessitate diversification of income sources. Improved education and high literacy level is an important tool for a household head to react smartly to declining disposable income. It was also shown that 17.5% of the respondents had no formal education while majority (82.5%) of the respondents is literates with one form of formal education or the other. The formal education observed were primary (27.2%) to secondary (35.8%) and to tertiary education (19.2%). The high level of literacy observed is good for the respondents as they are

expected to have greater knowledge of the importance of diverse income source. The analysis of the respondents' major occupation revealed that over half of the respondents had 54.4% farming as their primary occupation while 45.6% had other non-farm economic activities as their primary occupation. This shows that both farming and non-farming livelihoods are equally important to the rural economy. Migration is one form of livelihood strategy adopted by rural households. People move from one area to another in search of better livelihood sources and even in search of surplus food supply. The distribution of respondents based on their residential status revealed that majority (64.2%) of the respondents was migrants to the area while 35.8% are natives of the study area. This suggest that the natives of the study area are accommodating and has experienced large turn-in of migrants due to an enabling environment for agriculture and other non-farm economic activities. Household food security increases with increasing household monthly income (Oluyole *et al.*, 2009) Analysis of the respondents' monthly income revealed that a considerable number (50.8%) of the respondents had a monthly income between ₦10,001 - ₦30,000, closely followed by ₦30,001 - ₦50,000 range with 32.5%, while 5.8% had their monthly income more than ₦90,000. The mean monthly income of the respondents in the study area was ₦34,855. The average monthly income indicates that despite the respondents' diversification efforts, the outcome has been majorly for survival rather than totally coming out of poverty. Household income is important because it is a vital tool in assessing human well-being (Aruwajoye and Ajibefun, 2013). It is also revealed on Table 1, that majority (73.3%) of the respondents adopted the farming and non-farming combination as a strategy, while 15.8% and 10.8% adopted only the non-farming strategy and farming strategy respectively. Adopting a combination of livelihood strategies is easier than to resolve to switch between either. This finding corroborates with that of Adepoju and Obayelu (2013) that diverse income portfolio creates more income and allows the even distribution of income among household needs including their food need. Farm size is a reflection of the food production ability and income of the farming households (Ahmed *et al.*, 2015). Only land areas that are cultivated during the survey period are referred to as farm size. Based on this premises, only 101(84.2%) of the respondents were involved in farming activities at the time of the survey. The distribution of farm size is presented on Table 1. It shows that about 36.9% of the respondents have farm size less than 1 hectare and only 6.7% had farm size of 4

hectares and above. This suggests the subsistent nature of farming in the study area and this corroborates with the findings of Oni and Fashogbon (2013) and Aruwajoye and Ajibefun (2013) that majority of Nigerian farmers are small-scale farmers who cultivate less than 2 hectares. It is expected that increased farm size will increase food production and probably household food security status. Farming is an important enterprise in the study area. Majority (33.3%) of the respondents combined both arable and cash crop farming enterprise, 38 (31.7%) of the respondents were involved in arable cropping, 9 (7.5%) of the respondents were engaged in cash crop farming alone. The result shows that livestock farming is not a common enterprise in the study area. Only 3 (2.5%) of the respondents were involved livestock farming,4.2% combined arable, cash and livestock, another 4.2% combined Arable and livestock and 0.8% combined cash crop farming and livestock. The high percentage of respondents combining arable and cash crop farming shows that there is a high level of diversification even within the farming enterprise. The number of respondents involved in livestock keeping is relatively low and this suggests that livestock keeping is not a popular enterprise in the study area.

Table 1: Socio-economic Characteristics of Household Heads in the Study Area

Socio-economic characteristics	Frequency	Percentage (%)	
Age (years)			
20-29	8	6.7	
30-39	32	26.7	Mean=44.58
40-49	46	38.3	Std. D =11.28
50-59	21	17.5	
≥60	13	10.8	
Household Size			
1-3	26	21.7	
4-6	58	48.3	Mean=5
7-9	30	25.0	
≥10	6	5.0	
Level of Education			
No Formal Education	23	17.5	
Primary School Education	33	27.5	
Secondary School Education	43	35.8	
Tertiary Education	21	19.2	
Gender			
Male	97	80.8	
Female	23	19.2	
Marital Status			
Single	13	10.8	

Married	99	82.5	
Widow/Widower	8	6.7	
Type of Strategy Adopted			
Farming only	13	10.8	
Non-farming only	19	15.8	
Farming and Non-farming	88	73.3	
Primary Occupation			
Farming	72	54.4	
Non-farming	48	45.6	
Residential Status			
Migrant	77	64.2	
Native	43	35.8	
Monthly Income (₦)			
≤10000	7	5.8	
10001-30000	61	50.8	
30001-50000	39	32.5	
50001-70000	2	1.7	Mean=₦34,855
70001-90000	4	3.3	S.D=₦23,932.85
>90000	7	5.8	
Farm Size (Hectares)			
0.06-0.99	44	36.9	
1.00-1.99	26	21.6	
2.00-2.99	14	11.7	Mean=1.58
3.00-3.99	9	7.5	Std. D=1.13
≥4	8	6.7	
Total	**101***	**84.2**	
Farm Enterprise			
Arable cropping	38	31.7	
Cash cropping	9	7.5	
Livestock keeping	3	2.5	
Arable cropping and cash cropping	40	33.3	
Arable, cash and Livestock keeping	5	4.2	
Arable cropping and Livestock keeping	5	4.2	
Cash cropping and Livestock keeping	1	0.8	
Total	**101***	**84.2**	

Source: Field Survey, 2017, *Only 101 (84.2%) of the respondents were involved in farming as at the time of the survey.

3.2 Food Security Status Analysis

The food security status of the respondents was estimated using the Food Security Index. The index was used to classify the respondents into food secure and food insecure households. The mean per capita food expenditure (MPCFE) from the study was ₦4,508.52 while the bench mark, that is, two-third mean per capita food expenditure was ₦3,005.68. This means that household with per capita expenditure (PCE) less than ₦3,005.68 were classified as food insecure while households with per capita expenditure greater than ₦3,005.68 were regarded as food secure because they are able to meet their expected food expenditure. Based on this criterion, Table 2 shows that 67.5% of the respondents were food secure while 32.5% were food insecure. The high percentage of food secure households could be attributed to the prevalence of diverse livelihood sources among the respondents. About 73.3% of the respondents were found to engage in non-farm activities as an additional source of livelihoods. Again, those who were food insecure spent an average of ₦2,119.50 per month on food which was about 29% less than mean per capita food expenditure and this is presented as shortfall index in the Table 2. In the same vein, the average per capita food expenditure for food secure households was ₦5,820.00 which was about 94% above the bench mark for food security status and this is surplus index in the Table. The findings of this study were contrary to Omotesho et al. (2006) who observed 75% and 25% headcount ratio for food insecure and food secure households, respectively in their studies carried out among rural farming households in Kwara State, Nigeria. Muhammad-Lawal and Omotesho (2008), in their studies among cereals farming households in Kwara State, found out that about 60% of the households were food insecure. In line with the above authors, Fakayode et al. (2009) disaggregated food security with hunger and it was observed that 43.6% were food insecure without hunger; while 12.2% were food secure and only 8.3% were food insecure with hunger. Also, Ijatuyi et al. (2018) reported about 43.42% and 56.58% for food secure and food insecure, respectively for agricultural households in the Platinum Province of South Africa; and the value of food secure households is a bit higher than the previous studies. It could be noted that apart from Fakayode et al. (2009) who used percentage food item consumed, Omotesho et al. (2006), Muhammad-Lawal and Omotesho (2008) and Ijatuyi et al. (2018) used food calorie intake. This might be responsible for wide disparities in the values of food security status comparing with this study. Similar to the findings of this study, Tshediso (2017) classified food security status based on the Household Food Insecurity Access Scale (HFIAS) and found out that nearly 62.7% of the households were food secure.

Table 2: Distribution of Respondents Based on Food Security Index

Estimate	Food Secure	Food Insecure	Pool
Household (number)	81	39	120
Percentage Household (%)	67.5	32.5	100.0
Household size (number)	4	7	5
MPCFE (₦)	5,820.00	2,119.50	4,508.52
Food Security Index (FSi)	1.94	0.71	1.50
Headcount	0.68	0.33	
Shortfall	-	0.29	
Surplus	0.94	-	

Source: Field Survey, 2017

3.3 Effect of Diverse Income Sources on Household Food Security Status

The Probit regression model was used to estimate the determinants of household food security in the study area. The result of the probit regression model is shown on Table 3. The chi-square value of 70.35 which was significant at 1% suggests that the model has a strong explanatory power. It was revealed that marital status ($p \leq 0.01$, $z = -1.88$), living in own house ($p \leq 0.01$, $z = 4.26$), household size ($p \leq 0.01$, $z = -9.23$), total monthly income ($p \leq 0.05$, $z = 2.22$), monthly food expenditure ($p \leq 0.01$, $z = 3.19$) and households' number of income sources ($p \leq 0.001$, $z = 1.83$) were the variables that significantly influenced the food security status of the respondents. The positive coefficients influenced food security positively while the negative coefficients imply the tendencies of not being food secure.

Household Size: The coefficient of household size has a negative effect on food security status and is statistically significant at 1%. Specifically, a member increase in household size reduces the probability of being food secure by 0.088. In other words, an added dependent member to the household decreases the chance of such household to be food secure. This result corroborates with the findings of Omonona and Agoi (2007), Oni and Fashogbon (2013), Adepoju and Adejare (2013) and Amurtiya (2015) who found out that an increase in household size by one member increased the chance of the household not being food secure by indirectly reducing income per head, expenditure per head and per capita food expenditure *ceteris paribus*.

Marital Status: The coefficient of marital status is negative and statistically significant at 10%. The result implies that being a married household head reduces the probability of household being food secure by 0.203. This is attributable to the responsibilities that come to married household heads. This result agrees with the findings of Adepoju and Adejare (2013) that married household heads increased the probability of being food insecure. This is probably because being married comes with responsibilities of parenthood.

Own House: With respect to ownership of house, the positive relationship with food security which is significant at 1% indicates that the probability of a household being food secure increases with the possession or living in a house that belongs to the household. Specifically, there is an increase of 0.293 in the probability of being food secure when the household head owns a house. Possessing a personal residence does not only being an asset but saves the household head the cost of renting an apartment. Share of income which could have been spent on rent would probably be an addition to the money spent on food. Thus, increasing the probability of such household to be food secure.

Total Monthly Income: The coefficient of monthly income is positive and statistically significant at 5%. A naira increase in the amount earned by the household head as income in a month increases the probability of the household being food secure. Households pursue multiple income sources to increase their total income and their food security status is in turn improved through increased spending on food.

Monthly Non-Food Expenditure: The coefficient of monthly non-food expenditure is statistically significant at 1% and positive. This implies that a naira increase in the amount spent on non-food items by the household head increases the probability of household being food secure. The share of income spent on non-food relative to household size shows the level of welfare in the family and in turn assumed a food secured household.

Number of Income Sources: The coefficient of number of income sources is statistically significant at 10% and positive. This implies that, the more the number of income generating activities the household head engage in, the more their probability of being food secure increases. Specifically, an additional income source increases the probability of the household head being food secure by 0.121. Diverse

income sources which are prone to different risks and uncertainties help household to forestall the problem of food security and plan their livelihood accordingly. This result is in consonance with the results of Amurtiya (2015) who stated that alternative income sources outside farming provide enhanced security for household livelihood and thus their food security status.

Table 3: Results of Probit Model on the Effect of Diverse Income Source on Household Food Security Status

Explanatory Variables	Coefficients	Standard Error	Z
Age	-0.0039198	0.0038458	-1.02
Gender	0.1260639	0.0878085	1.44
Marital Status	-0.2026612	0.1078823	-1.88*
Education	-0.0088599	0.0071216	-1.24
Primary Occupation	0.0421576	0.0698203	0.60
Living in Own House	0.2925516	0.0686568	4.26***
Household Size	-0.0883235	0.0095665	-9.23***
Total Monthly Income	4.87e-06	2.19e-06	2.22**
Farm Size	-0.0094845	0.0180888	-0.52
Remittances	0.0561947	0.0904879	0.62
Monthly Non-food Expenditure	0.0000386	0.000021	3.19***
Livelihood training	0.1166339	0.1216285	0.96
Number of Income Sources	0.1213311	0.06614	1.83*

Number of observation=120, LR Chi^2(14) = 70.35***, Prob > Chi^2=0.0000,
Log Likelihood=-40.4932, Pseudo R^2=0.4649
*, Significant at 10%, **, Significant at 5%, ***, Significant at 1%
Source: Field Survey, 2017

3.4 Observed Non-Farm Income Sources
The distribution of respondents according to their non-farm income sources was shown on Table 4. It was revealed that many of the respondents engaged in more than one source of income for their livelihoods. According to the Table, food secure households had multiple sources than the food insecure households in the area. The first five non-farm income sources engaged by food secure households were petty trading, civil service, lumbering, tailoring and wage labour with proportion

of 24.56%, 17.54%, 9.65%, 7.89% and 5.26% respectively. In case of food insecure households, about 17.74%, 14.52%, 9.68%, 11.29% and 8.06% were engaged in petty trading, commercial motorcycling (*Okada*), barbing/hairdressing, tailoring and welding respectively. It was also observed that petty trading was most common source among both groups. Other observed non-farm activities the people were involved in were hunting, carpentry, food processing, mechanic, electronics repairing, bricklaying, clergy, photography, computer business centres, mechanic and others.

Table 4: Distribution of respondents according to their non-farm income sources

Activity	Food secure		Food insecure	
	Frequency	Proportion (%)	Frequency	Proportion (%)
Carpentry	3	2.63	2	3.22
Petty trading	28	24.56	11	17.74
Wage labour	6	5.26	3	4.84
Tiling	3	2.63	2	3.22
Bricklaying	2	1.75	4	6.45
Commercial motorcycling/driving	3	2.63	9	14.52
Tailoring	9	7.89	7	11.29
Chemist shop owner	2	1.75	-	-
Civil service	20	17.54	1	1.61
Hunting	5	4.39	2	3.22
Electronics repairing	1	1.91	2	3.22
Welding	3	2.63	5	8.06
Mechanic	4	3.51	2	4.83
Barbing/Hairdressing	3	2.63	6	9.68
Food processing	5	4.39	2	3.22
Photography	1	1.27	-	-
Computer business centre	3	2.63	-	-
Clergy	2	1.75	1	1.61
Lumbering	11	9.65	3	4.84
Total	**114***	**100**	**62***	**100**

Source: Field Survey, 2017; *Multiple responses allowed

Conclusion and Recommendations

Livelihood is a vital tool in measuring the food security status of households especially in the rural areas where the means of living is believed to be tied to agriculture. Households were seen to combine income sources for better livelihood. The effect of diverse income sources is seen in the level of food security that was obtained in the study. About 67.5% of the respondents were food secure. It was also observed that respondents combined both farm and non-farm income sources to improve their household well-being. The results of the probit regression also supports that the more the number of income sources of the household head, the better their chances of being food secure. The study therefore concludes that diversifying income sources into farming and non-farming activities, and particularly having multiple income sources is an antidote to household food insecurity problem. Based on the findings of the study, it is recommended that Government should promote non-farm employment as alternative income generating activities in addition to the farming enterprise. This may be a good way to improve the rural household income by helping the farmers to expand farm enterprise, which may in turn affect their per capita food expenditure and thus influencing their food security status positively. Subsequent policies of government should encourage diverse livelihood improvement strategies in addition to improving agricultural production. This can be achieved through improved rural infrastructures, establishment of skill acquisition centres that allows diverse income options to the rural dwellers. Also, effective extension training on interlinks between farm and non-farm income sources should be provided. This will encourage rural households to invest proceeds from their non-farm economic activities into farming, thus increasing agricultural production.

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