

## An Estimation of Food Security Status Among Rural Households in Edo State, Nigeria

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**ABSTRACT:** *There are indications that the food security situation in Nigeria has worsened in recent years. Worse hit by this situation, are the rural folks that lack access to sufficient resources to produce or buy quality food. The study focused on the estimation of food security status of rural households in Edo State, Nigeria. The income and expenditure pattern of respondents and their food security statistics were examined. Data used in the study were collected from both primary and secondary sources. Multistage sampling procedure, involving both purposive and random sampling techniques was used to select 360 respondents for the study. The income-expenditure approach as well as the food consumption (calorie intake) approach, were used to measure food security level of the respondents. The result showed that the mean annual household income in the study area was ₦341,407.94 with farm income constituting 64% while off-farm income constituted 36%. The mean annual household expenditure was ₦248,514.9 out of which expenditure on food accounted for 39% of total expenditure. The result further showed that the study area was food insecure as the estimated mean per capita calorie intake of 1,548.2 kcal fell below the FAO recommended food security line of 2,260 kcal. Assessment of the food security statistics of the study area showed that head count ratio was 0.10, shortfall/surplus index was -0.32 and mean food security index was 0.70. It can thus be concluded that rural households in Edo State are food insecure.*

**Keywords:** Food Security, Income, Malnutrition, Poverty, Rural Households

### Introduction

In many African countries, food security situation at both national and household level is poor. Nigeria, like other developing countries, is still facing persistent food crisis in spite of her vast land area of about 923,768 km<sup>2</sup>. She cannot produce enough food in adequate quantity and quality to feed her over 140 million people. The Food and Agriculture Organization [1], defined food security as a situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life. The percentage of food insecure households was reported to be 18% in 1986 and over 41% in 2004 [2]. The common people especially those living in the rural areas that lack access to sufficient resources to produce or buy quality food, are worse hit by this phenomenon. The food problem is indicated by high food import bill, consistent rise in domestic food price, high annual growth rate of food demand when compared to supply, and nutritional problem among others.

Over the years, a number of agricultural development initiatives have been introduced by successive Nigerian government to check the food security situation and make food available for the common man as a way of improving his standard of living. Some of the programmes itemized by Babatunde *et al.* [2], are the National Accelerated Food Production Programme (NAFPP), Agricultural Development Programme (ADP), Operation Feed the Nation (OFN), River Basin Development Authorities (RBDA), Agricultural Credit Guarantee Scheme (ACGS), National Agricultural Land Development Authority (NALDA), National Fadama Development Project (NFDMP) as well as the National Special Programme on Food Security (NSPFS).

In September 2011, the Federal Government of Nigeria unveiled its Agricultural Transformation Action Plan which is aimed at revolutionizing the sector in the next four years. The action plan is to transform agriculture from its current developmental status to a purely business endeavour, with emphasis on partnership, investment and accountability. This will enable Nigeria to be food-secure by increasing production of key food staples by 20 million tonnes with a view to creating over 3.5 million jobs with five-value chains.

In spite of these bold initiatives, food crisis still persist in Nigeria and food access is increasingly being constrained by high food prices. This has resulted in many rural households in Edo State and other parts of Nigeria experiencing inadequate food intake and harsh economic conditions owing to food insecurity. This paper seeks to answer the following research questions;

1. What is the income and expenditure pattern of rural households in the study area?
2. Are rural households in Edo State food secure?

The main objective of this study was to estimate the food security status among rural households in Edo State, Nigeria. In order to achieve this main objective, the specific objectives pursued were to analyze the income and expenditure pattern of households in the survey area as well as to estimate the food security status of the rural households in the study area.

The following hypotheses (Ho) were specified for the study:

1. The estimated food security status of rural households in the study area is not significantly different from the FAO recommended food security line of 2260 Kcal.
2. There is no significant relationship between total expenditure (consumption) and household income among rural households in the study area.

## Methodology

**Area and Scope of the Study:** The study was carried out in Edo State, Nigeria. The State lies between Longitudes 05° 04'E and 06° 45'E and Latitudes 05° 44'N and 07° 34'N. It is bounded in the South by Delta State, in the West by Ondo State, in the North by Kogi State and in the East by Kogi and Anambra States. It occupies a land area of about 17,920 km<sup>2</sup>. According to the 2006 population census, Edo State has a population of 3,233,366 (comprising 1,633,946 males and 1,599,420 females) accounting for 2.30% of Nigeria's total population. With a growth rate of 2.7% per annum, it is projected that the State population will reach 3,896,260 by 2013. The State is in the rain forest zone with annual rainfall of 1,300 mm – 2,300 mm per annum [3].

The State is divided into three agro-ecological zones, according to ADP delineation, with a total of eighteen Local Government Areas (LGAs). Edo State is an agrarian State made up of mostly farmers, fishermen and women as well as hunters. The nature of the climate favours the growth of variety of food and cash crops such as yam, cassava, maize, rubber, cocoa and others, such that they ought to be food secure. Art and craft work/bronze casting is also prominent in the State. The scope of this work covers availability of food and access to food by rural households in Edo State.

**Sources of Data:** Both primary and secondary data were used for the study. The primary data were collected by means of questionnaire administration and interview schedule. Information on the demographic characteristics of the respondents, income and expenditure patterns, mean per capita daily calorie intake of households, food security level among rural households, as well as factors affecting the attainment of food security were obtained through this method.

Secondary data were sourced from textbooks, journals, Internet, Food and Agriculture Organization (FAO) reports as well as other relevant publications.

**Sampling Procedure:** Multistage sampling procedure was used in this study. The study covered the entire State in line with the three agro-ecological zones delineated by Edo State Agricultural Development Project (EDOADP). These are Edo North zone with six Local Government Areas (LGAs), Edo Central zone with five LGAs and Edo South zone with seven LGAs.

The first stage was to randomly select two LGAs from each zone to give a total of six LGAs. The second stage involved the purposive selection of three rural communities (cells) in each of the six selected LGAs to give a total of eighteen (18) cells. The last stage was a random selection of twenty (20) households each within the selected communities. This gave a total of 360 households. However, only 338 copies of the questionnaire were found useful for the study, giving a response rate of 94%.

**Analytical Techniques:** To achieve the objectives of the study, appropriate analytical techniques were employed in analyzing collected data as follows:

**Objective 1:** To analyze the income and expenditure pattern of households in the survey area.

Frequency counts, percentages, mean, standard deviation and simple linear regression model were employed in analyzing the income and expenditure pattern of rural households. The choice of a linear regression model is as a result of established a priori relationship between income and expenditure. Following Koutsoyiannis [4] and Gujarati [5], the linear regression models were specified as:

**Income - expenditure (consumption) model:** (i)  $Y_e = \beta_0 + \beta_1 X_i + u_i$

Where:  $Y_e$  = total expenditure (consumption),  $X_i$  = household income,  $\beta_0$ - $\beta_1$  = coefficient and  $U_i$  = error term. The Marginal Propensity to Consume (MPC) which is the rate of change of consumption for a unit change in income =  $\Delta Y/\Delta X = \beta_1$

**Income – food expenditure model:** (ii)  $Y_f = \alpha + \beta_k X_k + u_k$

Where:  $Y_f$  = food expenditure,  $X_k$  = household income,  $\alpha$  and  $\beta_k$  = coefficient and  $U_k$  = error term. The Marginal Propensity for food expenditure on household income =  $\Delta Y/\Delta X = \beta_k$

The standard error test and the t – test were performed at 5% level of significance to test the statistical significance of the coefficients. Where the calculated t – statistic ( $t_{cal}$ ) is greater than the tabulated t – statistic, the variable was taken to be significant; if otherwise, the variable was taken as not significant.

**Objective 2:** To estimate the food security status of the rural households in the study area.

The mean per capita calorie intake of respondents in the survey was estimated using descriptive statistics such as frequency counts, percentages, mean, mode and standard deviation, while the t – test was used to ascertain if the estimated mean per capita daily calorie intake was significantly different from the FAO recommended 2,260 kcal per capita food security line at  $p \leq 0.05$ .

Where the calculated t-statistic is greater than the tabulated t-value, a statistical difference is said to exist between both nutrient levels, which imply that the study area is food insecure; but if the calculated t-statistic is less than the tabulated t, then no statistical difference exist between both nutrient levels and the study area is classified as food secure.

In addition, three indices of food security (headcount index, shortfall / surplus index, food security index were used to evaluate the food security status of the households as follows:

(i) **Food Security Index (Z):** Based on the FAO recommended food security line of 2,260 kcal per capita, a food security index (Z) was constructed from the relationship:  $Z_i = Y_i / R$

Where:  $Z_i$  = food status of ith household (in terms of calorie intake),  $Y_i$  = daily per capita calorie intake of ith household,  $R$  = recommended per capita daily calorie intake (2260 kcal).

The value of  $Z_i$  was used to dichotomize households as follows:

$Z_i \geq 1$  = food secure household,  $Z_i < 1$  = food insecure household.

(ii) **Headcount Index (H):** The headcount index (H) provides a measure of the proportion of households whose food consumption is below or above the food security line of 2,260 kcal per capita.

$$H = M / N$$

Where: H = Headcount index, M = Number of food secure (or insecure) households, N = Number of households in the sample.

(iii) **Shortfall / Surplus Index (P):** The shortfall / surplus index (p) measures the extent to which households are below (or above) the food security line.

$$P = 1/M \sum_{i=1}^m G_i$$

Where: P = Shortfall / Surplus index, M = Number of food insecure households,  $G_i$  = Per capita calorie intake deficiency of  $i$ th household,  $G_i = Y_i - R / R$ ;  $Y_i$  and R as defined above.

## Results and Discussion

**Income Distribution:** The mean annual income for households, as presented in Table 1, was ₦217,872.78 accounting for 63.82% of total household income, while off-farm income with a mean annual value of ₦123,535.16 accounted for 36.18%. The annual income was ₦341,407.94. This amount which is just a little above the prevailing minimum wage (₦216,000/annum) seems grossly inadequate and may not take care of the expenses of an average household in the study area. The implication of this result is that the income accruing to households in the study area may be unable to provide the needed daily food intake. It is expected that with higher income both from farm and off-farm, households tend to be food secure and with lower income, households would tend to be food insecure. This was also the position of Akpan [6].

The distribution of annual farm income as presented in Table 2 shows that majority of the households earned between ₦100,000 and ₦300,000. This implies that majority of the households in the study area (85.2%) earned low income from farm operations. The implication of the result is that, with such low farm income, respondent would have serious challenge in meeting household and other expenditure such as education, clothing, health etc, except where they have enhanced off-farm income. This is also an indication of food insecurity. This position however contrasts that of [7], which stated that the higher the farm income generated from the commercialization of agricultural production, the higher the food insecurity tends to be and vice versa.

The distribution of annual off-farm income in the study area is presented in Table 3. The result shows that about half (49%) of the households earned ₦40,000 and below, while 21.9% earned above ₦100,000. Some of the household heads had teaching jobs, some were pensioners and others were civil servants which explains why a good number of them earned above ₦100,000 because this category of respondents received salaries and pension which stepped up their off-farm income. The off-farm activities improved the households' livelihood. This is in line with the position of Zerai and Gebreegziabher [8], who posited that farmers who participated in nonfarm employments have shown improvements in daily food self sufficiency, housing, schooling of children, amongst others.

Omotesho *et al.* [9], also supported this view and posited that households that have non-farm sources of income tend to easily get out of poverty than households that do not have other sources of income outside the farm. Notwithstanding, this amount may not adequately take care of the needs of an average rural household. This position is in line with the opinion of Akinsanmi and Doppler [10], who reported that income from off-farm activities has not proven to be adequate in meeting households' need. Again when compared with the mean farm income presented in Table 2, it could suggest that most of the households in the survey area may be unable to mobilize sufficient financial resources both from farm and off-farm sources.

**Expenditure Distribution:** The distribution of mean annual household expenditure classified by budget item (as presented in Table 4) shows that food accounted for the bulk of the expenditure (39%). Education, clothing and other items like drinks, kerosene, etc accounted for the remaining 61%. The high expenditure on food by respondents could be an indication that there was low food production in the study area. Education took the larger share of the non-food expenditure (18%), which suggests that effort is being made to address the low level of education in the study area. However, where much income is committed to education, it reduces household income availability for food expenses. This was also the position of Asogwa and Umeh [7]. Health took the smallest percentage of the non-food expenditure (4%). This may be because the rural households mostly use traditional medicine which they sometimes prepare by themselves.

**Relationship between Income and Food Expenditure:** The Income - Food expenditure relationship for the study area is as shown in the following function:  $Y_1 = 70,777 + 0.060X_k$

Where:  $Y_1$  = expenditure on food and  $X_k$  = household income  
The marginal propensity for food expenditure was 0.060.

The estimated food expenditure function (derived from Table 5) showed a positive relationship between food expenditure and income. The value of marginal propensity for food expenditure calculated as 0.06 implies that if income goes up by ₦ 1, food expenditure will go up by about ₦ 0.06. The goodness of fit ( $R^2$ ) value of 0.13 means that, only 13% of variation in food expenditure was explained by income probably because majority of the rural households produce much of what they consume.

The distribution of annual household expenditure classified by expenditure class is shown in Table 6. The result shows that many respondents (59%) spent between ₦50,001 to ₦100,000. The mean annual household expenditure was ₦248,514.9, amounting to about ₦20,709.57 per month.

**Relationship Between Income and Consumption:** The income – expenditure (consumption) function for the study area was:  $Y_2 = 103, 659 + 0.273X_i$

Where:  $Y_2$  = expenditure on consumption,  $X_i$  = household income

The marginal propensity to consume (MPC), was found to be 0.27.

The estimated expenditure (consumption) function (Table 7), shows that a positive relationship existed between expenditure and income while the MPC value of 0.27 implies that a marginal increase in income would lead to a 0.27 increase in consumption. This result is in line with Keynes [11], who postulated a positive relationship between expenditure and income and inferred that MPC lies between 0 and 1. The goodness of fit ( $R^2$ ) value of 0.43 means that 43% of the total variation in expenditure was explained by income. The total expenditure - food expenditure function for the study area was also estimated to be:  $Y_3 = 27,942 + 0.326X_j$

Where:  $Y_3$  = total expenditure,  $X_j$  = food expenditure

**Table 1: Distribution of mean annual household income according to source**

Source of Income	Mean (X)	% of Total
Farm income (₦)	217,872.78	63.82
Off farm income (₦)	123,535.16	36.18
Total household income (₦)	341,407.94	100

Source: Survey Data, 2013.

**Table 2: Distribution of annual farm income**

Income Class	Frequency (n)	%	Mean Income
100,000 & below	72	21.3	
100,001 – 200,000	106	31.4	
200,001 – 300,000	110	32.5	217,892.78
300,001 – 400,000	19	5.6	
Above 400,000	31	9.2	
Total	338	100	

Source: Survey Data, (2012).

**Table 3: Distribution of off-farm income**

Income Class (₦)	Frequency (n)	%	Mean
20,000 & below	91	26.9	
20,001 – 40,000	76	22.5	
40,001 – 60,000	60	17.8	123,535.16
60,001 – 80,000	21	6.2	
80,001 – 100,000	16	4.7	
>100,000	74	21.9	
Total	338	100.0	

Source: Survey Data, (2012).

**Table 4: Distribution of mean annual household expenditure classified by budget item**

Budget item	Amount (₦)	%
Food	97,926.10	39.4

Education	45,648.32	18.4
Accommodation	30,025.00	12.1
Clothing	18,675.98	7.5
Others	18,000.00	7.2
Utilities	15,532.93	6.2
Transport	11,594.94	4.7
Health	11,111.67	4.5
Total	248,514.9	100.0

Source: Survey Data, (2012).

**Table 5: Result for income – food expenditure model**

Independent variable	Coefficients (b)	Std. Error	t
Constant	70777.939	3215.485	22.012
Income	0.060	0.008	7.222*

Source: Survey Data, (2012).

Dependent Variable: Food Expenditure  
*F value = 52.15 (p<0.050)*  
*R<sup>2</sup> = 0.13*

**Table 6: Distribution of household expenditure classified by expenditure class**

Expenditure class (₺)	Frequency (n)	%	Mean
25,000 & below	2	0.6	
25,001 – 50,000	27	8.0	
50,001 – 75,000	103	30.5	
75,001 – 100,000	88	26.1	248,514.9
100,001 – 125,000	58	17.0	
Above 125,000	60	17.8	
Total	338	100	

Source: Survey Data, (2012).

**Table 7: Result for Income – Expenditure (Consumption) Model**

Independent variable	Coefficients (b)	Std. Error	t
Constant	103659.033	6521.193	15.896
Income (Total)	0.273	0.017	16.141*

Source: Survey Data, (2012). *Dependent Variable: Total Expenditure*

*F value = 260.53 (p<0.050) R<sup>2</sup> = 0.435*

**Table 8: Distribution of household daily per capita calorie intake**

Calorie intake (kcal)	Frequency	%	Mean
1130 and below	170	50.3	
1131 – 2259	117	34.6	1548.2

2260 – 3390	26	7.7
>3390	25	7.4
Total	338	100.0

Source: Survey Data, (2012).

**Table 9: Summary of food security statistics**

Variable	Food secure	Food insecure	Pooled
Number of household	51	287	338
Head count ration (H)	0.151	0.849	
Shortfall/surplus index (p)	0.87	-0.52	-0.32
Mean food security index	1.9	0.5	0.70
Per capita calorie intake (kcal)	4236.4	1070.5	1548.2
Mean household size	5	7	7

Source: Survey Data, (2012).

*Note: recommended daily per capita calorie intake (R) = 2260kcal.*

**Household Daily per Capita Calorie Intake:** The distribution of household daily per capita calorie intake, as presented in Table 8, shows that about 50% of the respondents had daily per capita calorie intake of 1,130 kcal and below, while 35% had daily calorie intake of between 1,131 kcal and 2,259 kcal, 8% had daily calorie intake of between 2,260 kcal and 3,390 kcal, while 7% had daily calorie intake of 3,390 kcal and above. The mean per capita daily calorie intake in the study area was found to be 1,548.2 kcal, which is below the FAO recommended 2,260 kcal level. This result shows that majority of the households fall below the recommended 2,260 kcal and could therefore be termed food insecure.

The result of food security statistics, as presented in Table 9, shows that only 51 households were food secure while 287 households were food insecure. The head count ratio for the food secure households was 0.15 while that for food insecure households it was 0.85. The result is an indication that 15% of households in the study area were food secure while 85% of the households were food insecure. The shortfall/surplus index (which measures the extent of deviation from the food security line) for the food secure households was 0.87 while the shortfall/surplus index for food insecure household was -0.52. The result again, suggests that food secure households exceeded the recommended per capita calorie requirement by 87% while the food insecure household fell short of the calorie required by 52%. On the average, all the households in the study area fell short of the calorie requirement by 32%, the negative sign indicates that the households were below the food security line. The mean food security index for the food secure households was 1.90, while that for the food insecure households was 0.50. The result indicates that the food secure households exceeded the 1.00 mark required to classify them as food secure while the food insecure households fell below. All the households in the study area fell short of the 1.00 mark. It could thus be inferred that the study area was food insecure.

The food secure households had a mean per capita calorie intake of 4,236.4 kcal which was higher than the 2,260 kcal FAO recommended threshold level, while the food insecure households had a mean per capita calorie intake level of 1,070.5 kcal, which is lower than the 2,260 kcal FAO recommended level. On the average, all households in the study area had per capita calorie intake level of 1,548.2 kcal. This again implies that the study area was food insecure having fallen short of the 2,260 kcal benchmark.

### Conclusion and Recommendations

Rural households in Edo State, Nigeria were found to be food insecure. This may be attributed to low household income which is closely related to low food production. This means most rural households in Edo State have challenges in meeting household and other expenditure such as education, clothing, health etc, except where they had enhanced off-farm income. This is also an indication of food insecurity. The mean annual household expenditure of respondents, which was not sufficient for an average family size of seven, is only a confirmation of the level of poverty across rural households in Edo State.

Based on the findings of this study it is recommended that any food security programme designed for the study area should focus on increasing rural household income derivable from agricultural sources. This is because agriculture was shown to be the predominant occupation in the study area.

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