

Determinants of Food Security among Low-Income Households in Maiduguri Metropolis of Borno State, Nigeria

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ABSTRACT

The need to identify the food secure as target groups and achieving a better understanding of the determinants of food security cannot be overemphasized. This paper examined the determinants of food security among low-income households in Maiduguri Metropolis of Borno State Nigeria. Using purposive and multi-stage random techniques, 120 low-income households were selected for the study. Descriptive, Cost-of-calories method, Logit model and household dietary diversity scores were used as analytical techniques for the study. Based on the recommended daily energy levels of 2260 kcal, a food security line of N24,786.00 per adult equivalent per year was obtained for the households. Only 39% of the sample households are therefore food secure. The logit analysis revealed that the major determinants that positively influence food security in the study area are farm size, co-operative membership, level of education, gender of household head, assets, credit, child dependency ratio, extension agent's contact and diet diversity while age and household size negatively influence food security. Therefore, it is imperative that improving wage earning capacity and exploring income diversification opportunities are crucial in enhancing food security status and general welfare of households. Government should give adequate priority and attention to policy measures directed towards educating and provision of better family planning. Also, launching of enlightenment programmes on nutrition education especially on the different food groups and dietary diversification practices among the low income households could enhance food security in the study area.

Keywords: Food security, low-income households, family planning, education

INTRODUCTION

From the colonial period up to the 1970s, Nigeria was mainly an agricultural economy. It was among the world's leading producers of Cocoa, Palm oil, Groundnuts, Cotton, Rubber and Hides and Skin. The agricultural sector contributed over 60% to the GDP. However, with the advent of commercial oil exploration in the early 1970s the fortunes of agriculture started to dwindle, with a resultant downward decline in productivity. Principally, domestic production of most food commodities had not kept pace with demand. Among other factors, Helleiner (1996) observed that population growth, change of food preference, urbanization; inflation and demand from neighbouring countries are among some of the factors that continue to affect food availability, its accessibility and affordability in Nigerian households. The interaction of these factors has led to food insecurity and the idea of self-sufficiency is becoming more and more difficult to achieve due to declining agricultural production and inefficient food marketing system.

Given the role of agriculture in Nigerian economy, the poor performance of the sector directly creates supply shortages and indirectly creates demand shortages thereby denying the households access to sufficient income. The food problem was not peculiar to Nigeria. It attracted a global attention as more than 800 million people throughout the developing

countries and some other 40 millions in developed world do not have enough food to meet their basic needs and millions more experience hunger, malnutrition, growth retardation and sometime death due to starvation. This number of people without enough food to eat on a regular basis remains stubbornly high and is not falling significantly (FAO.2003).

Among the development problems facing Nigeria as observed by Hall (2002) and Sanusi *et al.* (2006), food insecurity ranks topmost. The level of food insecurity has continued to rise steadily since the 1980s. It rose from about 18% in 1986 to about 41% in 2004. Maziya-Dixton *et al.* (2004) also reported that over 40% of households across all agro-ecological zones in Nigeria face the problem of severe food insecurity. Food insecurity therefore remains a fundamental challenge in Nigeria. The concept of the food problem is complex and goes beyond the simplistic idea of a country's inability to feed its population.

FAO (2002) in *The State of Food Insecurity in the World*, observed that "Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". The challenges of food security can be at national, regional, local or household levels. At the national level for example, a nation is food secure when the majority of the population have access to food in adequate quantity and quality consistent with decent existence at all times. A region within a country is food secure when the majority of the population in that geo-political region has access to food in adequate quantity and quality consistent with decent existence at all times. A locality is food secure when the majority of the population in that locality has access to food of adequate quantity and quality consistent with decent existence at all times. At the household level, food security exists when all members of the family have access to food in adequate quantity and quality consistent with decent existence at all times.

Availability of food at the household level requires that food must be available either through their own-farm operations or by purchasing the food from the market. In most cases, the food produced from own-farm operation is inadequate and this makes a good marketing system very important to ensure food availability. FAO (1997) submitted that if available food could be evenly distributed (through efficient national and international markets), each person would be assured of 2,700 calories a day, which is the recommended daily calorie intake. However, since available food is not evenly distributed (due to marketing inefficiencies and other problems), there are shortages of food in some regions but excess in others. Therefore, the issue of how much food gets to the households, which is fundamental in household's food security, is a function of food production level, food marketing efficiency and the households' income level.

Urban households continue to face varied economic conditions which impact on their living standard and food security situation which consequently create gaps in resource availability and considerable imbalance between the demand and supply of food among the poor households. The impact of this is that the food situation gets worse, hence food insecurity. Household incomes alone have not been proven to be adequate to meet households' needs. This situation requires that the determinants of food security be known for a guided change. The influential factors which militate against households' food security status must also be examined and understood.

Whether viewed globally, within the nation, the state, or in local communities, food security is an essential, universal dimension of household and personal well-being. The deprivation of basic need represented by food insecurity and hunger are undesirable in their own right and also are possible precursors to nutritional, health, and developmental problems. Monitoring food security, therefore, can help to identify and understand this basic aspect of well-being of

the population and to identify population subgroups with unusually severe conditions. Hence, this study will attempt to examine the underlying factors that determine food security status among low-income households in Maiduguri metropolis of Borno State, Nigeria. The extent of the study examined the socio-economic characteristics of respondents; measured the calorie intake of low-income households; measured the food security status; identified the determinants of household food security; and identified food intake diversity of low-income households.

METHODOLOGY

The Study Area and Data

The study was carried out in Maiduguri Metropolis, the capital city of Borno state. It is located on latitude 115⁰ N and latitude 135⁰E. Maiduguri is the largest and main commercial city in the North Eastern Nigeria. It occupies an area of 69,436 square kilometres (km²). According to the 2006 population census, Maiduguri has a population of 521,492 people with an annual growth rate of 2.8%. Maiduguri Metropolis is ecologically characterized as a sehelian savannah with mainly grasses, shrubs, and few trees. The climate condition of the State is hot and dry for most part of the year. It has low rainfall which ranges from 500 mm to 1000 mm annually and a low relative humidity ranging from 42% to 49%. The average temperature is about 20⁰C (Maryah, 2005).

The majority of the populace of the Maiduguri Metropolis is civil servants, traders, military and paramilitary and artisans. Major crops cultivated in the study area are millet, sorghum, maize, groundnut, wheat, cowpea and the major livestock reared are cattle, sheep, goats and poultry production hence the determinants of food security and food security status of the low-income group could reflect to some extent the food security situation in the State.

Purposive sampling was used to select the study area and wads based on population density. The multi-stage sampling technique was used in selecting households in the study area. Two (2) urban wards purposively chosen based on population density were Wulari and Gwang to represent the low income group. Households in Maiduguri vary in terms of income levels due to its cosmopolitan nature.

Residential locations were used as proxy to capture different income groups in the study area. However, this does not mean that a particular ward consist only a particular income group residing there. It is possible that all the three (3) income groups (low, medium and high) be found in a particular ward. But this is done to ensure that the low-income income group was adequately captured. Seventy (70) households were randomly selected from each of these wards making a total of 140 low-income households in the study area. Data were collected on socio-economic characteristics, food expenditure and food consumption pattern.

Data Measurement and Analytical Technique

Descriptive statistics and inferential statistics (the cost-of-calories [COC], Logit models and Household Dietary Diversity Score [HDDS]) are the analytical techniques used for the study.

Descriptive Statistics

This was used to examine the socio-economic characteristics of respondents. These techniques include means, frequencies and percentages which were used to catalogue and categorize households by socio-economic characteristics.

Cost-of-Calories [COC]

The COC method proposed by Greer and Thorbecke (1986) was used to estimate the food security line. The method yields a value that is usually close to the minimum calorie requirements for human survival. A minimum level of nutrition necessary to maintain healthy living was identified. This minimum level is referred to as the ‘food security line’ for the area under study, below which people are classified as food insecure, subsisting on inadequate nutrition. Calorie adequacy was estimated by dividing the estimated calorie supply for the households by the household size adjusted for adult equivalence using the consumption factor for age-sex categories. The food security line is given as:

$$\ln X = a + bC \dots\dots (1)$$

Where:

X= adult equivalent food expenditure (in Naira) and

C= actual calorie consumption per adult equivalent of a household (in kilocal).

The calorie content of the recommended minimum daily nutrients level (L) 2260Kcal employed by (Babatunde *et al.*, (2007): FAO, 2009; Oluyole 2009) was used to determine the food security line S using the equation:

$$S = e^{(a+bL)} \dots\dots (2)$$

Where:

S= Cost of buying the minimum calorie intake (food security line);

a= Intercept;

b= Coefficient of the calorie consumption;

L= FAO recommended minimum daily energy (calorie) level.

Table 1. Conversion factors for calorie requirement for different age groups

<i>Years of age</i>	<i>Male</i>	<i>Female</i>
0-1	0.27	0.27
2-3	0.45	0.45
4-6	0.61	0.61
7-9	0.73	0.73
10-12	0.86	0.78
13-15	0.96	0.83
16-19	1.02	0.77
20 and above	1.00	0.73

Source: FOS, (2004)

Logit Model

In the Logit model, the data on the dependent variable (food security status) is bivariate, that is, food secure and food insecure households. The model assumes that being food secure is a continuous status. The model expresses households’ food security status as a function of

linear combination of observable explanatory variables, some unknown parameters and an error term (e).

The implicit form of the model is expressed as:

$$Y_i = g(I_i) \dots\dots (3)$$

m

$$I_i = b_0 \sum_{j=1}^m b_j X_{ji} \dots\dots (4)$$

j=1

Where:

Y_i is the observed response for the i th observation (i.e., the binary variable, $Y_i = 1$ for a food secure household and $Y_i = 0$ for a food insecure household); I_i is an underlying and unobserved stimulus index for the i th observation for each household; if $I_i^* \geq I_i$ the household is observed to be food secure, if $I_i^* \leq I_i$ the household is observed to be food insecure; g is the functional relationship between the field observations (Y_i); (I_i^*) the stimulus index determines the probability of being food secure; and (I_i) the stimulus index determines the probability of being food insecure. The empirical model used for determining factors that influenced food security status among low-income households in Maiduguri was specified as:

Therefore, for the i th observation (a household)

$$I_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{14}X_{14} + b_{15}X_{15} + b_{16}X_{16} + e \dots\dots (5)$$

Where:

P_i = the probability of an i th household being food secure stands for dummy, X_i = vector of explanatory variables which are defined as: X_1 = Age of household head (AGE) in years; X_2 = Income of household (HHINC) in Naira; X_3 = Farm size of a household (FARMSZ) in hectares; X_4 = Household size (HHSZ); X_5 = Farming experience (FARMEXP) in years; X_6 = Co-operative membership; (COOP) D= 1, if yes; D = 0, otherwise; X_7 = Level of education (EDUC) in years; X_8 = Sex of household head (SEX) D = 1 for male, D = 0 for female; X_9 = Household assets (HHAAS) in Naira; X_{10} = Household production enterprise (FARMENT); D= 1, if yes; D= 0, otherwise; X_{11} = Household head's access to credit facilities (CREDIT) D=1 if yes, otherwise D= 0; X_{12} = Child dependency ratio (CDR); X_{13} = Household head's access to extension agents (EXTAG) D=1 if yes, otherwise D=0; X_{14} = Hired Labour (HLAB) in man/day; X_{15} = Family Labour (FLAB) in Naira; and X_{16} = Diet Diversity (DD) in HDDS scores D= 1, high diet diversity (6-12); D = 0, (0-5) low diet diversity; b_0 = constant; and e = error term.

Household Dietary Diversity Score (HDDS)

Dietary diversity was measured by summing the number of foods or food groups consumed over a reference period. The HDDS scores which ranged between 0-12 was used to measure household's dietary diversity and also ranked accordingly into high dietary diversity (6-12) and low dietary diversity (0-5) (FAO, 2008b). HDDS indicator for sample population was also measured by the sum of HDDS of households divided by the total number of households.

Twelve (12) food groups included in the HDDS were: Cereals; roots and tubers; Vegetables; Fruit; Meat, poultry, offal; Eggs; Fish and sea foods; Legumes, nuts and seeds; Milk and milk products; Oils and Fat; Sugar/honey, condiments and Beverages (FAO, 2007). These food groups were used to identify food intake quality of the households. Foods locally consumed

in these food groups were determined and considered for the measure of food intake diversity in the study area.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Households

This section presents the socioeconomic characteristics of the sampled households in Tables 2 and 3. Respondents' household heads' mean age was 43 years and had an average of six (6) persons per household and mainly children. The mean farm size was 1.83 hectares with an average of 13 years farming experience. Also, household heads spent an average of about 10 years in formal education and majority of household heads had no access to agricultural loan.

Table 2. Distribution of Households by Social Factors

<i>Social Factors</i>	<i>Low-Income Households</i>	
	<i>Freq.</i>	<i>%</i>
<i>Sex</i>		
Male	118	98.3
Female	2	1.7
<i>Age (years)</i>		
20 – 29	19	15.8
30 – 39	29	24.4
40 – 49	30	25
50 - 59	34	28.3
60 and above	8	6.7
Mean = 43		
<i>Household size</i>		
Less than 5	25	20.8
5 – 9	84	70
10 – 14	11	9.2
Above 15	-	-
Mean = 6		
<i>Farm size (hectares)</i>		
Less than 2	49	42.2
2 – 3.99	54	46.6
4 – 5.99	13	10.8
Mean = 1.83		

(Continued...)

Table 2 . Distribution of Households by Social Factors (...Continued)

<i>Social Factors</i>	<i>Low-Income Households</i>	
	<i>Freq.</i>	<i>%</i>
<i>Level of Formal Education (years)</i>		
No Education	13	10.8
Quranic	48	40
Primary sch. (not completed)	6	5
Primary sch. (completed)	8	6.7
Secondary sch. (not completed)	14	11.7
Secondary sch. (completed)	12	10
Post secondary	19	15.8
<i>Child dependency ratio</i>		
No dependency	60	50
0.1 – 0.4	53	44.2
0.5 – 0.8	5	4.2
0.9 and above	2	1.7
<i>Farm experience (years)</i>		
Not involved in farming	-	-
Less than 10	65	54.2
10- 19	46	38.3
20 – 29	5	4.2
30 – 39	4	3.3
Mean = 13		
<i>Membership of cooperative</i>		
Membership	47	39.2
Non membership	73	60.8
<i>Extension agent' contact</i>		
Contact	9	7.5
No contact	111	92.5

Source: Field Survey, 2011.

Table 3. Distribution of Households by Economic Factors

<i>Economic Factors</i>	<i>Low income households (LIH)</i>	
	<i>Freq.</i>	<i>%</i>
<i>Access to Agricultural Loan</i>		
Accessible	26	21.7
Not Accessible	94	78.3
<i>Monthly Income (¥)</i>		
Less than 20,000.00	-	-
20,000 – 39,000.00	38	31.7
40,000 – 59,000.00	52	43.3
60,000 – 79,000.00	30	25
<i>Types of Assets</i>		
Land	34	28.3
Motor vehicle	23	19.2
Motor cycle	82	68.3
Hand sets	91	75.8
Radio/T.V. set	120	100
Livestock	59	49.2
Bicycle	102	85.0
Shares	32	26.7
Others(sewing machines, fridges, guns etc)	28	23.3

Source: Field Survey, 2011.

* Multiple responses existed

Household Food Security Statistics

The summary statistics of food security measures among the low-income households is presented in Table 4. Based on the recommended daily energy levels (L) of 2260 kcal, the food security line (S) for the households was found to be N 68.85 per day per adult equivalent (N2065.50 per month per adult equivalent). On an annual basis, this is equivalent to N 24786.12 per adult equivalent. From the food security line, it was shown that 61% of the sampled households are food insecure by headcount (H) which implies that only 39% of the sampled low-income households were food secure. Furthermore, the aggregate income gap (G) of -676.54 indicates the food insecure households would need N676.54 to meet their monthly basic food requirements.

Table 4. Summary statistics and food security measures among low-income households

<i>Household</i>	<i>Low-income</i>
<i>Constant</i>	4.232 (34.790)
<i>Slope Coefficient</i>	0.0000 (1.154)
<i>FAO recommended daily energy Level (L)</i>	2260 Kcal
	N68.85 per day
<i>Food security line Z: Cost of the minimum energy requirements per adult equivalent</i>	N481.95 per week
	N2065.50 per month
	N27786.00 per year
<i>Head Count (H)</i>	0.61 (food insecure)
	0.39 (food secure)
<i>Percentage Household</i>	61% (food insecure)
	39% (food secure)
<i>Aggregate Income Gap (G)</i>	-676.54

Source: Calculations from OLS estimates and cost-of-calories equation, 2011

*Figures in parenthesis are t-values

Determinants of Food Security Status among Low-Income Households

The results of the Logit regression for low-income households are presented in Table 4. Analysis of the survey data revealed that 11 out of 16 variables included in the model were significant in explaining the variation in food security status of respondents. The variables included in the model were age and household size which negatively relate to food security. Others were farm size, co-operative membership, level of education, gender of household head, assets, credit, child dependency ratio, extension agent's contact and diet diversity positively relate to food security in the study area. The coefficient of variables in the model were significant at 1% ($P < 0.01$) and at 5% ($P < 0.05$) levels respectively. This indicates that the model was a good fit to the data. The summary of the significant determinants among the low-income households are discussed in table 5.

The age (AGE) of the household head is significant at 5% but is negatively related to food security. This implies that as the household heads advance in age, the probability of being food secure decreases. The household size (HHSZ) reveals a significant but negative relationship at 1% with household food security. This shows that households with large size have a higher possibility of being food insecure than those with smaller size, and vice versa. Cooperative membership (COOP) is positively correlated to food security at 5%. Active participation in cooperative activities tend to attract benefits in terms of helping members in mobilizing resources within society for agricultural operations and marketing, access to inputs (essential manufactured goods) at cheaper rates, enables members take advantage of economies of scale in production, processing and marketing of agricultural produce. It is expected that as the level of participation increases, the probability of being food secure increases. Educational level (EDUC) of household head is positively correlated at 5%. This indicates that the higher the numbers of years spent in formal education, the more food secure

the household, and vice versa. The gender of the head of household (GEND) reveals a significant positive relationship with household's food security status at 5%. Households headed by males have a higher probability of being food secured than their female counterparts.

Table 5. Maximum Likelihood Estimates (MLE) of Logit Regression Analysis for Low-Income Household

<i>Variable</i>	<i>Coefficient</i>	<i>t-value</i>
Constant	7.525	2.631***
AGE(X ₁)	-0.0991	-2.752**
HHINC(X ₂)	2.939	3.948
FARMSZ(X ₃)	.00000341	.086
HHSZ(X ₄)	-.830	-2.665***
FARMEXP(X ₅)	.282	1.508
COOP(X ₆)	2.406	2.336**
EDUC(X ₇)	.159	1.960**
GEND(X ₈)	1.201	1.909**
ASSETS(X ₉)	.00000764	2.232**
FARMENT(X ₁₀)	.359	.814
CREDIT(X ₁₁)	6.695	4.032***
CDR(X ₁₂)	-2.162	-3.376***
EXTAG(X ₁₃)	.0005994	2.700***
HLAB(X ₁₄)	.0000326	.782
FLAB(X ₁₅)	.000559	2.283**
DD(X ₁₆)	.0977	2.204**

Significant at 1%; ** at 5%. Source: Computer Printout, 2011

Also, a significant positive relationship existed between household's assets (ASSETS) and food security level at 5%. Assets serve as buffers and seen as readily available convertible resources to meet household needs in lean periods. Ownership of assets therefore lays a good foundation for food security and general household livelihood sustenance. Access to credit (CREDIT) is positively correlated to food security at 1%. Food security status increases as households are economically empowered and vice versa. A negative relationship existed between child dependency ratio (CDR) and food security but was significant at 1%. Households with high dependency ratio may lack sufficient manpower which ultimately results in over dependence on limited family resources hence food insecurity. Households' access to extension agents (EXTAG) is positive and significant at 1% to food security status. Households that have access to extension agents have a higher probability of being food secure than those that do not have such access and vice versa. Access to extension agents enhances the chances of households having better crop production techniques, improved

inputs, as well as other production incentives and these affect their output vis-à-vis their food security status.

The coefficient of family labour (FLAB) was significant at 5% and exhibited a positive correlation to food security. This is plausible as the use of family labour reduces cost of production and it is expected that food requirements of the family members are provided for from the farm output. This implies that the higher the involvement of family members in farming/agro-processing, the higher the probability of food security and vice versa. The coefficient of diet diversity (DD) was significant at 5% and had a positive sign suggesting that diet diversity is more prevalent among food secure households than food insecure households and vice versa.

Diet Diversity

Dietary diversity was employed as a qualitative measure of food consumption in the study area. It reflected households' access to a wide variety of foods (twelve (12) food groups included in the HDDS). Dietary diversity indexes have been shown to be good proxies for calorie intake and nutritional outcomes (Ruel, 2006). To better reflect diet quality of households in the study area; households were grouped into low diet diversity (0-5) and high diet diversity (6-12). The number of different food groups consumed was calculated, rather than the number of different foods consumed.

Table 6. Diet diversity among low-income households

Diet Diversity	Low-income Households	
	Frequency	%
Low	87	72.5
High	33	27.5
Total	120	100

Source: Field Survey, 2011

The summary statistics of diet diversity measures among the low-income households is presented in Table 6. The result in Table 6 shows that majority of low-income households (72.5%) belong to the low food diversity range. Reliance on only purchased food rather than own production or both ultimately predisposes the low-income households in the Maiduguri Metropolis to low dietary intakes. It is noteworthy that food available for consumption in urban areas was primarily produced in rural and semi-urban areas or imported. Therefore, access to food in cities is heavily dependent on cash exchange, with few exceptions, where urban food production contributes directly to household intake.

Furthermore, this income group is particularly vulnerable to price changes due to limited income and cash reserves (Maxwell *et al.* 2000). This ultimately have a negative impact on the food security situation of the households. Therefore, high dietary diversity is likely to be an indication of household food security. This result further authenticates the high level of food insecurity (61%) among the sample households in the study area.

CONCLUSION AND RECOMMENDATION

Sequel to the result of the food security line obtained, the study vividly confirmed the association between some households' socioeconomic characteristics as captured by the

variables in the study area influenced the food security status among sample households. Therefore, the study observed that understanding of these socioeconomic characteristics and the independent influence they exert on the level of food security in the households is particularly important. It is expected that the synergistic effect of these factors will lead to the implementation of future meaningful food security strategies in the study area.

Based on the findings of this study, the following policy measures aimed at improving households' food security status in the study area were recommended.

1. Household income, which was identified as one of the significant determinants of food security was very low among sample households in the study area. It is imperative that improving wage earning capacity and exploring income diversification opportunities are crucial in enhancing food security status and general welfare of households. This will involve combination of enterprises and off-farm activities that could generate more income for the households.
2. Government should give adequate priority and attention to policy measures directed towards educating and provision of better family planning. This will help control household size for healthy life and general welfare of household members.
3. The launching of enlightenment programmes on nutrition education especially on the different food groups and dietary diversification practices among the low income households. This will help households re-orient their daily diets towards the consumption of a more diversified diet.
4. Household gardening provides households with cheap and readily available food requirements. This will help to improve households' access to quality food at affordable prices.

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