ANALYSIS OF FOOD SECURITY AMONG FARMING HOUSEHOLDS IN IMO STATE, NIGERIA

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Abstract
Prevalence of food insecurity has remained a concern in Imo State and indeed the Sub-Saharan Africa. Hence, this study investigated the analysis of food security among farming households in Imo State, Nigeria. Multi-stage random sampling technique was used to select 144 farmers for this study. Information on the objectives of this study was elicited from the sampled respondents through a well- structured questionnaire. Data were analyzed using descriptive statistics, Food security index and Probit regression model. Results showed that the mean age of the farmers was 64 years, 7 persons per household and 12 years of educational attainment. Results also showed that only 35.4% of the farming households were able to meet the recommended calorie intake of 2500kcal per capita per day, while remaining was not. This result portrays that the study area is food insecure since the proportion of food insecure households is greater than that of food secure ones. The food surplus/insecurity gap index showed that food secure households exceeded the calorie requirement by 314%, while the food insecure households fell short of the calorie requirement by 76%. Age, household size, educational attainment, farming experience, farm size, access to credit, quantity of own production were determinants of food security status of the farm households. The study recommended that government in collaboration with other stakeholders in agriculture should strengthen existing policies in food crop production.

Keywords: Food Security, Farming Households, Farm Productivity, Probit Model, Imo State

Introduction

Food is the basic need and necessity of life that must be satisfied before any other emerging need (World bank, 2002). Its importance is seen in the fact that it is a basic means of sustenance and adequate food intake, in terms of quantity and quality, is a key for healthy and productive life. The importance of food is also shown in the fact that it accounts for a substantial part of a typical Nigerian household budget (Omonona and Agoi, 2007). Food security focuses primarily on food availability and to some degree the price stability of basic food stuffs at the international and national level (Clay, 2002; FAO, 2005). 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 (Idachaba, 2006; Duffuor, 2011; FAO, 2012). According to FAO (2010), food security underlies the consumption, at any time, by all members of the household (men, women, boys, and girls) of an alimentation adequate in quality and quantity, for an active healthy life. The concept of food security includes both physical and economic access to address people's needs and preferences. In that way, a household should have the possibility to consider all its members at all times. FAO (2013) enlisted three main steps towards achieving food security such as; food availability, food accessibility, and food utilization. Firstly, food must be available in sufficient quantities, continuously and consistently. The concept refers to stocks and production in a given area, and the capacity to import food from elsewhere. It implies self-sufficiency of a household, of the community, and of the nation as a whole. Secondly, people must be able to regularly acquire food, through home and local production or importation. Food access suggests the availability of sufficient resources to obtain nutritious food, without resorting to emergency aid or other coping strategies. Food access refers equally to sharing practices within the household. Hence, household food access is the ability to obtain sufficient food of guaranteed quality and quantity to meet nutritional requirements of all household members. Here, the food should be at right place at the right time and people should have economic freedom or purchasing power to buy adequate and nutritious food. Lastly, there must be absolute utilization of available food (includes storage, processing, preservation, cooking, and consumption) and also it must be accessible to farm households without waste.

However, the concept of food security cannot be complete without relating it to the households' level. A household is considered food secure when its occupants do not live in hunger or fear of starvation (FAO, 2001). Households' food security can be defined as the ability of individuals to access an adequate supply of food, on stable basis, and in sustainable way (World Bank, 2006). FAO (2001) further opined household food security as access by all people at all times to enough food (of good quality) for an active, healthy life. Consequently, absence of food security is food insecurity; food insecurity on the other hand represents lack of access

to enough food or exists when people do not have adequate physical, social or economic access to food which can either be chronic or on temporary basis (Amaka *et al.* 2016). They further opined that chronic food insecurity arises from lack of resources to acquire and produce food thereby leading to persistent inadequate diet. FAO (2010) refers to food insecurity as the consequences of inadequate consumption of nutritious food bearing in mind that the physiological use of food is within the domain of nutrition and health. When individuals cannot provide enough food for their families, it leads to hunger and poor health. Poor health reduces one's ability to work and live a productive healthy life (Otaha, 2013). According to Cruz (2010) and Valdés *et al.*, (2010), majority (more than 80 per cent) of the smallholder farmers in the world are food insecure and depend on land as their primary source of livelihoods. Studies (Nweze and Gloria, 2013; Out *et al.*, 2014) have identified low agricultural productivity among others as responsible for food shortage and insecurity among farm households. Cases of malnutrition and under nutrition are growing by the day. As a result, the energy food intake requirements of most farm households have fallen far below the international standard (Olajide and Dopple, 2013). Similarly, the changing climatic pattern and over reliance on rain-fed agriculture pose a serious food security challenge in rural areas. Other associated threats to food security include; inconsistent government policies, gender inequality, poor extension services, crude agricultural practices, poverty, illiteracy, population increase, corruption, political instability, extreme weather conditions, pests and livestock diseases, and environmental issues such as erosion, flood, drought, desertification, etc these impacts negatively on crop production thereby leading to food reduction (Nweze and Gloria, 2013; Olajide, 2014). This study set out to determine the food security indices of farmers, determinants of food security status as well as the socio-economic characteristics of the farmers in Imo State.

Materials and Methods

This study was carried out in Imo State, Nigeria with a land area of 5,530 sqkm. The State lies between latitudes $4^0 45^I$N and $7^0 15^I$N and Longitudes $6^0 50^I$E and $7^0 25^I$E. The State is located in the South-Eastern rainforest belt of Nigeria. The State shares boundaries with Abia and Cross Rivers State to the East, Delta State to the West, Rivers State to the South and Enugu and Anambra State to the North (ISSYB, 2004). The State has a total of 27 Local Government Areas (LGAs) which is divided into 3 Agricultural zones namely; Owerri, Orlu and Okigwe. Across these zones, agriculture is a major economic activity predominant amongst the people of the state.Multi-stage sampling technique was adopted for this study. First, two Local Government Areas (L.G.As) were randomly selected from each of the three agricultural zones. From these Local Government Areas, three communities were chosen. Finally, ten farmers were randomly selected from each of these three communities, bringing a total of one hundred and eighty (180) farmers. However, the study made use of only 144 farmers due to the invalidity in some of the sample instrument returned. Data for this study were collected through primary sources using a set of structured questionnaire. In order to realize the objectives of the study, Descriptive statistics, Food security index, and Probit regression model were employed. Food security index as adopted by Babatunde *et al.*, (2007) and John *et al.* (2013) was used to analyze the food security status of the farming households based on the food security line. The FAO (2010) recommended minimum daily energy requirement per adult equivalent is 2500kcal; therefore this value defines the food security line for the study. Households which are below the food security line are classified as food-insecure households while those households that are equal or above the food security line are classified as food-secured households. Daily per capita calorie consumption of each household and households' daily calorie intake were also estimated by dividing through with the household size adjusted for adult equivalents using the consumption factor for age–sex categories. Hence, the food security index is given thus;

$FSI = \frac{H_D}{R_D}$----------Eqn. 1

Where

FSI = Food security index

H_D = Households daily per capita calorie intake

R_D = Recommended daily per capita calorie requirement

Households' calorie content was estimated using food nutrient composition table of commonly eaten foods in Nigeria which was converted into kilogram. The energy content of 1kg of each foodstuff (maize, cassava, rice, yam, plantain, etc) was used in this study.Furthermore, food insecurity gap index (FIG), food surplus gap index (FSG) and the headcount ratio (HCR) of food security were calculated for the sample households based on the food security index. The food insecurity gap measures the extent to which food insecure households on average fall below the food security line and the food surplus gap measures the extent by which food secure households exceeded the food security line. The headcount index measures the percentage of sampled household that are food insecure/secure. The head count ratio, food insecurity gap, and food surplus gap as adopted by (Out *et al.*, 2014) are defined as follows;

Headcount index (H_{fi}) = $\frac{M}{N}$----------Eqn. 2

Headcount index (H_{fs}) = $\frac{L}{N}$---------- Eqn. 3

Food insecurity gap index (FIG) =
$\frac{1}{M}\sum_{i=1}^{m} G_{iWhereG_i=\frac{Y_i-R}{R}----Eqn.\ 4}$
Food surplus gap index (FSG)
$=\frac{1}{L}\sum_{i=1\ G_i} where\ G_i = \frac{Y_i-R}{R} - - - Eqn.5$
Where M = number of food insecure households; N = total number of households in the sample; L = number of food secure households; Gi = daily per capita calorie deficiency or surplus for ith household; Hfs = headcount index for food secured households; Hfi = headcount index for food insecured households; Yi = daily per capita calorie consumption on food item of ith households; R= recommended daily per capita calorie requirement.
Probit regression model was employed to assess the determinants of food security among farming households in the area. Probit model was used in this study due to its simplicity in the interpretations of the coefficients. The dependent variable in this case, food security status is a binary variable which takes a value of one (1) for food secured household and zero (0) for food insecure household. The model as adopted by Godwin and Aondonenge (2016) and Oluyole *et al.* (2009) is implicitly specified as;

$FSI = X_i\beta + U_i$

Where
FSI = Household food security status (food secure households =1, food insecure households = 0)
β = Vector of the parameter estimates
U_i = Error term
X_i = Vector of explanatory variables: which includes;
X_1 = Age of Household (Years)
X_2 = Gender of Household (male =1, female = 0)
X_3 = Household Size (No. of Persons)
X_4 = Educational Attainment (Years)
X_5 = Farming Experience (Years)
X_6 = Farm Size (Hectares)
X_7 = Off-Farm Activity (Naira)
X_8 = Household Income (Naira)
X_9 = Access to Credit (Naira)
X_{10} = Quantity of Own Production (Kilogram)

Results and Discussion

Socio-Economic Characteristics of Household Farmers in Imo State

Table 1 show that the mean age of the household farmers' was 64 years. This implies that they farmers are getting older by the day and this might have a tremendous influence on their output as well as food security (Osuji, 2017). Mean household size in the area was 7, this indicates that more of the family labour which is very vital in farm production is utilized, since majority of farmers in rural areas uses more of family labour as against paid labour (Ojogbo, 2010). The mean educational attainment of the farmers was 12 years which implies that the household farmers are relatively educated to take critical decision concerning their farming enterprises. Education enhances farmers' innovativeness and effectiveness which aid food output and security (Osuji, 2017). Farming experience of the farmers was 18 years. This implies that household farmers are well experienced to increase their output and secure enough food for family consumption. The mean farm size was 1.4 hectares which implies that farmers in the area operated on small scale basis, hence cultivating less than 2.0 hectares of land (Henri-Ukoha *et al.* 2013). Household income has a mean value of ₦9,600 which connote low income of the households which makes it difficult for them to purchase essential farm inputs and implements.

Table 1: Socio-Economic Characteristics of Household Farmers in Imo State

Variable	Mean
Age of Household (Years)	64
Household Size (No. of Persons)	7
Educational Attainment (Years)	12
Farming Experience (Years)	18
Farm Size (Hectares)	1.4
Household Income (Naira)	9,600

Source: Field Survey, 2016

Food Security Indices of Farming Households in Imo State

The distribution of food security indices of farming households in the study area is presented in Table 2. The result shows that 35.4% of the farming households were food secured with an average food security index of 2.96; hence, the farming households that were able to meet the recommended calorie intake of 2500kcal per capita per day. However, 64.6% of the farming households were food insecure with an average food security index of 0.81. This means the farming households that were unable to meet the recommended daily per capita calorie requirements of 2500kcal. This result further portrays that the study area is likely food insecure since the number of food insecure households (93) is greater than food secure households (51). This finding is consistent with that of Nweze and Gloria (2013); John *et al.*, (2013); and Otu *et al.*, (2014) that two third of the farming households study were not food secured. Pooled mean household size is 15 persons indicating 6 persons for food secured household and 9 persons for food insecure household. The 9 persons for food

insecure household could portray adults who are only dependent but do not contribute to food provision. However, the average daily per capita calorie intake for food secure household was 5744.21kcal, which is higher than the recommended minimum daily calorie requirement of 2500kcal by FAO (2010) and national average requirement of 2700 kcal (Babatunde *et al.* 2007). The average daily per capita calorie intake of food insecure households was 1970.44kcal, which is far lower than the national average and the recommended minimum daily calorie requirement. This result is also consistent with Otu *et al.* (2014) that the average daily per capita calorie intake of food insecure households was far lower than the national average and the recommended minimum requirement by FAO (2010). The food surplus/insecurity gap index which measures the extent of deviation from food security line shows that food secure households exceeded the calorie requirement by 314%, while the food insecure households fell short of the calorie requirement by 76%. This shows a wide margin between the food secure and food insecure households in the study area. The result further revealed a head count ratio of 0.35 for food secured household and 0.65 for food insecure household.

Table 2: Distribution of Food Security Indices of Farming Households in Imo State

Food Security Indices	Food secure households	Food insecure households	Pooled
Percentage of households	35.4	64.6	100
Number of households	51	93	144
Mean of household size (Adult equivalent)	6.0	8.5	15
Mean Food security index	2.96	0.81	3.77
Std	0.42	0.026	0.446
Mean households daily calorie intake(kcal)	49461.07	9622.06	59083.13
Mean household per capita daily calorie intake (kcal)	5744.21	1970.44	7714.65
Food surplus/insecurity gap	3.14	0.76	4.0
Head count ratio	0.35	0.65	1

Source: Field survey, 2016

Determinants of Food Security Status of Farming Households' in Imo State

Table 3; presents the estimated determinants of food security status of farming households' in the study area. The chi ($\chi 2$) was highly significant at 1 percent and this confirms the fitness of the model. The Pseudo R-square of 0.8409 implies that all the explanatory variables included in the model were able to explain 84% of the variation in food security status of the households. The log-likelihood ratio of 122.31 further confirms the fitness of the model in explaining the probability of the effect of the explanatory variables on household food security status. The coefficient of educational attainment, farming experience , farm size, access to credit, quantity of own production were positive and determinants of food security status of the farm households while the coefficient of age of household and household size showed an inverse determinants of food security status of the farm households. Gender of household, off-farm activity, and household income were not statistically significant which exclude them as determinants of food security status of the farm households.

The coefficient of age was negative and significant at 5%. This implies that food security declines with increase in age. The inverse effects of the age of household heads decrease the probability of households being food secure, and this is consistent with the findings of Agboola (2004) and Godwin and Aondonenge (2016).

The coefficient of household size was significant at 5% and an inversely related with food security. This implies that increase in household size decreases the probability of households being food secure. An increase in household size especially the non-working members put pressure on consumption than production and thus increases food insecurity level of households (Feleke et al., 2003; Babatunde et al., 2007; Ojogbo, 2010).

The coefficient of educational attainment was positive and significant at 1% level. This indicates that increase in educational levels of the farm households increases the probability of the households being food secure. The more educated a farmer is the more food secure the farmer will be. Level of education influence farmer's adoption rate which agrees with (Henri-Ukoha et al., 2013; John et al., 2013).

The coefficient of farming experience was positive and significant at 1% implying that increase in farming experience of a farmer increases the probability of the households being food secure. The more experienced the farmer is, the more food secure he will be. This affirms that experience improves the adoption of innovation and improved technology faster. An experienced household head is expected to have more insight and ability to diversify his or her production to minimize risk

of food shortage (Henri-Ukoha et al., 2013; John et al., 2013).

Farm size was observed to be positive and significant at 1%. This indicates that the larger the farm size, the probability of the households being food secured. This is consistent with a priori expectation that food security of households increases with increase in farm size. This could mean that the larger the farm size, the higher will be the plant population density, then the higher the output. This agrees with Henri-Ukoha et al., (2013) and Godwin and Aondonenge (2016).

The coefficient of access to credit was positive and significant at 5% implying that the more access the farmer has to credit, the probability of the households being food secured. Credits enable farm households to acquire productive resources such as (improved planting materials, farm lands, fertilizers, pesticides, etc) which boost food crop production. This is consistent with a priori expectations and supports Babatunde et al., (2007) and Pappoe (2011)

Quantity of own production was also positive and significant at 5%. The positive sign of the variable indicates that the higher the output levels of household, the greater the likelihood of food security. Hence, the quantity of household own production increases the probability of food security of the households. This supports the findings of Quinoo (2010), Pappoe (2011) and John et al., (2013).

Table 3: **Estimated Determinants of Food Security Status of Farming Households**

Variables	Coefficients	T-values	Std Error
Constant	0.1446	2.1063*	0.0687
Age of Household	-0.6531	-2.5212*	0.2590
Gender of Household	0.1601	1.2201NS	0.1312
Household Size	-0.7014	- 2.7132*	0.2585
Educational Attainment	0.8821	3.3283**	0.2650
Farming Experience	0.2742	2.9804**	0.0920
Farm Size	0.1540	3.0425**	0.0506
Off-Farm Activity	0. 7514	1.0012NS	0.7504
Household Income	0.0710	1.3043NS	0.0544
Access to Credit	0.2013	3.3411**	0.0602
Quantity of Own Production	0.1814	3.9023**	0.0465
LR (χ^2)		176.57**	
Log likelihood		122.31	
Pseudo (R^2)		0.8409	
N		144	

Source: Field survey data, 2016.

Note: **; * indicates statistically significant at 1 percent, and 5 percent level of significance respectively. NS, indicates non-significance

Conclusion and Recommendations

The findings of the study showed that only 35.4% of the farming households were able to meet the recommended calorie intake of 2500kcal per capita per day, while 64.6% were not. This result portrays that the study area is likely food insecure since the proportion of food insecure households is greater than that of food secure households. The food surplus/insecurity gap index which measures the extent of deviation from food security line shows that food secure households exceeded the calorie requirement by 314%, while the food insecure households fell short of the calorie requirement by 76%. Educational attainment, farming experience, farm size, access to credit, quantity of own production were positive and determinants of food security status of the farm households. To this end, government in collaboration with other stakeholders in agriculture should strengthen existing policies in food crop production, review the land use policy, introduce farmers' agricultural education and provide agricultural incentives to farmers. This will help boost farm productivity with a resultant increase in food output and food security in the area.

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