Modelling Bases of Household Food Security in Adamawa State, Nigeria Using Logistic Regression Model

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**Abstract:** Food security is a concept that has developed considerably over the years. It is a complex issue that characterises the current world economy. This study provides empirical evidence on the bases of household food security among rural households in Adamawa State. Data were collected through 300 randomly selected households via the used of structured questionnaires. Logistic Regression model was used to examine the bases of food security among the households surveyed. The variables involved were Gender, Household Size, Marital Status, Off-Farm Income, Credit Access, Age, Education Level, Fertilizer Application, and Labour. The results revealed that the probability of a food secure household depends on various factors such as gender, household size, marital status, Off-farm Income and Educational Level and were found to significantly influence household food security. Therefore the study recommends that Entrepreneurial programmes should be introduce by government to encourage households to grow their own food and sell it. This can be a good incentive for generating extra income that is needed in the household.

**Key Words:** Household Food security, Logistic regression, Adamawa.

**1.0 Introduction**

Food security and insecurity are terms used to describe whether or not households have access to sufficient quality and quantity of food. Food security issues gained prominence in the 1970s and have since been given considerable attention. Food security is perceived at the global, national, household and individual levels. Food security at global level does not guarantee food security at the national level. Moreover, food security at the national level does not guarantee food security at the household or even the individual level. Food is a basic necessity of life. Its importance at the household level is indicated by the fact that it is a basic means of sustenance; the adequacy of which (in quantity and quality) is a key requirement for healthy and productive life. The provision of adequate and balanced food (nutrition) is necessary for the survival of the society in the sense that it is essential for the maintenance of good health and successful implementation of development plans. The implications of Nigeria being unable to provide adequate food and nutrition to feed her teeming population should be obvious from these facts. These facts led Aderinola and Adeyemo (2001) to claim that Nigeria was a food-deficit nation and that the average per caput protein intake of Nigeria per day of 50.8g (made up of 85.5% and 14.5% of vegetable and animal sources respectively) was grossly inadequate when compared with the world's minimum protein requirement of 70.0g per caput per day; 50.0% of which must be from animal origin! They claimed further that the poor level of nutrition caused the masses of the Nigerian people (especially nursing mothers and young children) to suffer serious ailments such as kwashiorkor and marasmus arising from acute protein deficiency in their diets. The harsher economic situation in the country and the worsening purchasing power of the national currency (the Naira) would have made many more Nigerians lack access at all times to sufficient quantity and quality of safe nutritious food for an active and healthy life. Although the World Health Organization (WHO) recommends a minimum of 20grams of animal protein per caput per day for food security, only a total of 7.2; 7.6 and 4.9 grams were taken in the northern, western and eastern parts of Nigeria respectively! These figures gave a national average of 6.6 grams per caput per day. Attempts by governments (particularly at the Federal Level) to import food massively to solve the food supply deficits in Nigeria presents
a situation at the national level which does not guarantee food security among various households in the country. Thus, adequate food supply at the national level does not automatically lead to food security for many households the bulk of which is poor and does not have the purchasing power to procure the food it needs in adequate quantity and quality. Food prices continue to soar day by day. According to the Central Bank of Nigeria (CBN, 2000), the inflation rate which was 3.2% in 1972 rose sharply to 39.6% in 1984; 40% in 1989; 72.8% in 1995 before it dropped drastically to 10% in 1998 and 7.0% in 2000 (CBN 2000). With an average per caput income per month in Nigeria of N300 (Business Times, 2000) households' incomes could hardly cope with soaring food prices in the country.
This situation had necessitated that between 60.0% and 80.0% of households' incomes were spent on food in Nigeria. However, whatever the reasons for food insecurity may be, solutions to the problem could be found through short and long-term agro-ecological, socioeconomic or multi-sectorial food based interventions economic.

While aggregate data are generally available at the national level, little work has been done to understand the food security problem at the household level in specific locations/districts. Having national food balance data is not sufficient to understand the food security dynamics in the country. Most agricultural production comes from millions of rural households. Despite the increasing global concern of improving food security, the nature and extent of food security at the household level in rural areas is not well documented.

**1.1 Definitions and Concepts of Food Security**

 Food security is a concept that has evolved over time. As much literature has spiralled, many definitions and conceptual models on household food security have been presented (Smith et al., 1992). There are approximately 200 definitions and 450 indicators of food security (Hoddinott, 1999). In Africa, food crisis in the early 1970s stimulated a major concern on the part of the international donor community regarding supply short falls created by production failures due to drought and desert encroachment (Maxwell, and Frankenberger1992). In 1983, FAO analysis focused on food access, leading to a definition 1st Annual International Interdisciplinary Conference, AIIC 2013, 24-26 April, Azores, Portugal - Proceedings- 516 based on the balance between the demand and supply side of the food security equation: “Ensuring that all people at all times have both physical and economic access to the basic food that they need” (FAO, 1983). In the World Bank (1986) report, Poverty and Hunger, this concept of food security is further elaborated in terms of: ‘access of all people at all times to enough food for an active, healthy life.’ At the 1996 World Food Summit 182 nations agreed and adopted a still more complex definition: ‘Food security, at the individual, household, national, regional and global levels. Food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO, 1998). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food. As a result, a synthesis of these definitions, with the main emphasis on availability, access, and utilization, serves as working definition in projects of international organizations.

**1.2 Food security Components:-**

Common to most definitions of food security are the elements of availability, access, utilization and stability or sustainability.

**1.3 Availability**

 In this context, availability refers to the physical existence of food, be it from own production or on the markets. On national level food availability is a function of the combination of domestic food stocks, commercial food imports, food aid, and domestic food production, as well as the underlying determinants of each of these factors. Use of the term availability is often confusing, since it can refer to food supplies available at both the household level and at a more aggregate (regional or national) level. However, the term is applied most commonly in reference to food supplies at the regional or national level (Riely et al., 1999).

**1.4 Access**

Access emphasizes on having sufficient resources to obtain appropriate foods for a nutritious diet. It is the way different people can obtain the available food. Normally, we access food through a combination of home production, stocks, purchase, barter, gifts, borrowing or food aid. Food access is ensured when communities and households and all individuals within them have adequate resources, such as money, to obtain appropriate foods for a nutritious diet (Riely et al. 1995). Access depends normally on; income available to the household, the distribution of income within the household, the price of food, and other factors worth mentioning are individuals’ access to market, social and institutional entitlement/rights (ibid).

**1.5 Utilization**

Utilization has a socio-economic and a biological aspect. If sufficient and nutritious food is both available and accessible the household has to make decisions concerning what food is being consumed (demanded) and how the food is allocated within the household. In households where distribution is unequal, even if the measured aggregate access is sufficient some individuals may suffer from food deficiency.

**1.6 Stability**

Stability or sustainability refers to the temporal dimension of nutrition security ( i.e. the time frame over which food security is being considered). In much of the food security literature, a distinction is drawn between chronic food insecurity—the inability to meet food needs on an ongoing basis—and transitory food insecurity when the inability to meet food needs is of a temporary nature (Maxwell and Frankenberger, 1992).

**1.7 Determinants of Food security**

Factors that affect household food security in various developing countries especially in Africa have been documented in some literature and these factors or determinants are most often than not location-specific (i.e. different study areas were found to have variant attributes as food security determinants with some attributes recurring). The study conducted by Study by Sikwela (2008) in South Africa using logistic regression model showed that per aggregate production, fertilizer application, cattle ownership and access to irrigation have positive 1st Annual International Interdisciplinary Conference, AIIC 2013, 24-26 April, Azores, Portugal - Proceedings- 517 effect on household food security whereas farm size and household size have negative effect on household food security. Babatunde et al. (2007) is another detailed work on food insecurity in Nigeria. The study utilized a three-stage random sampling technique to obtain a sample of 94 farm households and a cross sectional data in year 2005. Using the recommended calorie required approach; the study revealed that 36 per cent and 64 per cent of the households were food secure and food insecure respectively. The Shortfall/Surplus index showed that the food secure households exceeded the recommended calorie intake by 42 per cent, while the food insecure households fell short of the recommended calorie intake by 38 per cent. A logit regression model estimated showed that household income, household size, educational status of household head and quantity of food obtained from own production were found to determine the food security status of farming households in the study area.

The purpose of this study was, therefore, to assess the level of critical bases food security in the rural areas in Adamawa State, Nigeria.

**1.8 The main objectives of the study were to**:

1. Examine the prime bases of household food security in the study area.
2. fit an appropriate model for the base of food security in the study area and

**1.9 Research questions**

What are the bases of households’ food security status of the study area?

**2.0 MATERIALS AND METHODS**
**2.1 Area of Study**

The area of study is Adamawa State located in the North Eastern part to Nigeria, which was carved out of the former Gongola State on the 17th August 1991, with headquarters in Yola. It is bordered by Borno and Yobe State in the North, Gombe State in the West, Taraba State in the South and the Republic of Cameroun from the East (along Nigerian international border). It lies between latitude 80 N and 110 and longitude 11.50 and 13.50E. It covers a land mass of 39,742.12 square Kilometres that is about 4.4% of the land area of Nigeria. It has a population of 3,168,101 based on the 2006 census. The state has 21 local Government areas and 50 State Development Areas (Adamawa State Government House Dairy, 2014).

**2.2 Population**

The population of the study covered twenty one (21) local government areas of Adamawa State.
**2.3 Sample and Sampling Strategy**

A Random Sampling Technique was used to collect data and a sample size involved 300 households.

**2.4 Source of Data**

The study was based on secondary data which were obtained through a structured questionnaire.
**2.5 Variables Measured**

The variables used in this research work were dichotomous dependent variable Y (food secured and not-food secured) and the independent variables which were offences Gender, Household Size, Marital Status, Off-Farm Income, Credit Access, Age, Education Level, Fertilizer Application, and Labour.

**2.6 Method of Data Analysis**

The data collected were analysed using logistic regression model.

The Model;

$ P\_{i}$ ~ logit-1

Where: $P\_{i}$ = the probability that an individual is being food secure given $X\_{i}$

$X\_{i}$ = a vector of explanatory variables

β = regression vector parameters to be estimated.

The above model can be written as;

 Probability (food security) =

 In this study the explanatory variables used in the model included:

 = Gender of Household Head (GN) – (Male =1, Female = 0)

 = Household size (HS)

 = Marital Status of household Head (MS) – (Married =1, Otherwise=0)

 = Off-farm income activity (OFA)- (If yes =1, otherwise= 0)

= Credit Access (CA)- (if yes =1, otherwise= 0)

 = Age of Household Head (AGE) in years

 = Education level of Household Head (EL)

= Fertilizer Application (FA)-(if yes =1, otherwise= 0)

= Labour (L)

**3.0** **RESULTS AND DISCUSSION**

**3.1: Results**

**Table 3.1: Factors that determine household food security in Adamawa State**

|  |  |  |
| --- | --- | --- |
| Variables | Coefficient | Standard Error |
| Gender(GN) | 0.8643\*\* | 0.4910 |
| Household Size(HS) | -0.3228\*\*\* | 0.1415 |
| Marital Status(MS) | -0.9174\* | 0.4995 |
| Off-Farm Income(OFI) | 0.0050\*\*\* | 0.0001 |
| Credit Access(CA) | -0.0005\*\* | 0.0002 |
| Age | -0.0141 | 0.0227 |
| Educational Level(EL) |  0.0048\*\*\* | 0.0499 |
| Fertilizer Application(FA) | 0.7345 | 0.5697 |
| Labour(L) | 0.3421 | 0.2309 |
| N=300 |  |  |
| Prb>F=0.000 |  |  |
| Pseudo =0.1860 |  |  |
| *Log Likelihood*=-130.2974 |  |  |

\*\*\*Significance at 1%, \*\*Significance at 5%, \*Significance at 10%

**Model 1**

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**3.2 DISCUSSION**

The above results were summarized as follows; the first variable is Gender of household head (male = 1; female = 0): This variable is positive and significant at 5% level (p < 0.05). The emphasis of gender assessment is on male. The results therefore indicate that a male-headed household has a higher chance of being food secure as compared to a female-headed household. This means that the probability of food security increases if a household is headed by male as compared to a household headed by a female.

Household size result revealed significant (1% level of significance) and negative relationship between household size and food security. This implies that an increase in household size decreases the probability of a household being food secure. This is because an increase in household size tends to increase the quantity of food consumed in a household. However, this applies only when the additional member does not contribute less than what he/she consume. This finding is in line with other similar studies (Amaza *et al*. 2012:26 and Mitiku *et al*. 2013:137), that found significant and negative relationship between household food security and household size.

Marital status result revealed (Married = 1, Otherwise = 0) significant at 10% level of significance. This shows that the likelihood of food security will decrease if a household is headed by a married person compared to an unmarried household head. This is because married couples have larger household sizes than those of unmarried households’ heads. These results are contrary to a similar study by Oesi *et al*. (2013:038) which found that food security was associated with marital status of the household head.

Off-Farm income revealed that, the variable is positive and significant at 1% level of significance. An increase in off-farm income improves household food security because generally more food can be produced or purchased. Off-Farm income is the most significant determinant for household food security, with regards to food accessibility.

The Age variable is not significant in explaining household food security. The negative sign of the coefficient indicated that an increase in age leads to a decrease in the probability of a household being food secure.

Education: This variable is significant in explaining the food security status of households in. The positive sign indicates that the probability of a household being food secure deceases with an increase in educational attainment. Furthermore this indicates that the higher the educational level by the household head, the higher food the security of food in house.

Fertilizer Application: This variable is not significant; but the coefficient has a positive sign indicating that fertilizer has positive effect on household food security.

Labour force result revealed that, the variable was not significant; but the coefficient has a positive sign indicating that the labour force has a positive effect on household food security. This implies that additional members who are able to work are most likely to contribute to the consumption of food in the household.

**4.0** **CONCLUSION AND RECOMMENDATIONS**

**4.1 Conclusion**

The aim of the study was to assess the level of critical bases food security in the rural areas in Adamawa State, Nigeria. The suggestion of the results observed indicates that the probability of a food secure household depends on various factors such as gender, household size, and marital status, Off-farm Income and Educational Level. Off-Farm Income is the most significant determinant of household food security, through the accessibility of acquiring sufficient food.

**4.2 Recommendations**

The purpose of this section is to suggest strategies aimed at improving household food security. The recommendations in the study are based on the findings and conclusions made from the data collected

1. Off-Farm Income was regarded as the most significant determinant for household food security. It is therefore vital that the government promote agricultural education in the study area, by encouraging households to participate in food gardening/farming activities as a source of generating extra income.
2. The household size was a significant determinant for household food security; therefore it is important to educate the community about family planning in order to encourage households to plan for smaller family sizes, particularly for female headed households.
3. Entrepreneurial programmes are also needed in the area to encourage households to grow their own food and sell it. This can be a good incentive for generating extra income that is needed in the household.

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