Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.4, No.8, 2014

Food Security and Coping Strategies among Ethnic Groups in North Central Nigeria

Mary O. Agada[1*] and Edwin M. Igbokwe[2]

1. Institute of Food Security, University of Agriculture, PM.B. 2373 Makurdi, Nigeria

2. Department of Agricultural Extension, University of Nigeria, Nsukka, Enugu State, Nigeria
*E-mail of the corresponding author: maryagada59@gmail.com

Abstract
A study was conducted to identify the factors influencing food security and the coping strategies utilized during food shortage among ethnic groups in rural North Central Nigeria in 2011. A random sample of 120 Tiv, 108 Igala and 112 Eggon households were interviewed to find out the quantities of every food item consumed in the household in the past 24 hours and the coping strategies employed during food stress. The analysis was done using frequency, percentage, mean scores and logit regression. The findings indicated that while the majority (68%) of the Tiv households were food secure, only 45% of the Eggon and 42% of the Igala were food secure. In all, 51.8% of the households were food secure. Socio-economic factors such as output from own production ($t= 2.89$; $p \leq 0.05$), farm income ($t= 2.21$), annual income ($t=2.79$; $p \leq 0.05$) and household size ($t= -7.64$; $p \leq 0.05$) were found to be important correlates which affect food security. The study also showed that the mean coping strategy index for Igala, Eggon and Tiv ethnic groups were 44.8, 37.5 and 34.4 respectively and 38.5 for the entire population. The commonly adopted coping strategies for the entire population were reliance on less preferred food (95.8%) and limiting food portions at meal times (83.5%). Although slightly above half of the households were food secure, calorie consumption was just at the threshold of adequacy while the use of coping strategies is a reflection of the poor access to food by households. Thus, food remained an issue in North Central Nigeria. Therefore, it is imperative for policy makers to plan to improve food availability and to increase family income to enhance quality of rural life.
Keywords: factors, food security, coping strategies, rural households, ethnic groups, North Central Nigeria

1. Introduction

Food security has different aspects depending on the focus, ranging from global, regional, national, community and household to individual levels. Food security is defined as the condition in which 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 (Food and Agriculture Organisation [FAO], 2002). Attaining this level of food security requires the availability of food supply, adequate access to food supply, appropriate utilization of food and stability of food supply (Gross, Schultink & Kliemmann, 1998). Food availability for farm households in rural areas means ensuring that sufficient food is available for them through their own production or through sufficient purchasing power to purchase food from markets. Access by households and individuals to appropriate foods for a nutritious diet depends on income available to the household, on the distribution of income within the household and on the price of food. Food utilization depends on optimal uptake of nourishment, which is a function of a sustaining diet, child care, clean water, adequate sanitation and healthcare (United Nations Environment Programme [UNEP], 2002). Stability of food supplies means that households should not risk losing access to food as a consequence of sudden shocks such as climatic crisis or cyclical events such as seasonal food insecurity (IFPRI, 2009). Food insecurity on the other hand connotes a situation in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives.

Concerns over the food security situation in the world are reflected in the Millennium Development Goal (MDG) of eradicating extreme poverty and hunger, including reducing by half the proportion of people who suffer from hunger between 1990 and 2015. However, the number of undernourished people in the world has been increasing annually by 4 million malnourished people such that in 2010 the number of hungry people in the world was estimated at 925 million. This increase has been attributed to neglect of agriculture relevant to very poor people by governments and international agencies, the current worldwide economic crisis, and the significant increase of food prices (FAO, 2010; 2011a). The world population was estimated to be 7 billion people in 2011 (United States Census Bureau [USCB], 2012). Thus, 13 percent of the world's population, or almost 1 in 7, is hungry. According to the World Hunger Education Service [WHES] (2011), nearly all those who are undernourished are in developing countries with the worst scenarios in Asia (578 million) and sub-Saharan Africa (239 million).

The prevalence of undernutrition in sub-Saharan Africa (SSA) declined slightly from 31 percent between 1990 and 1992 to 29 percent in 2000/2002 and decreased again to 27 percent between 2006 and 2008 (FAO, 2011b). However, even with the decline, about 239 million people in SSA continue to face chronic hunger (WHES, 2011). This is largely because of a high level of poverty resulting from overdependence on subsistence agriculture, limited access to off-farm employment, sluggish development in urban areas and skewed income distribution (FAO, 2006). As a result, more than one in every four Africans is undernourished, and the inability to consistently acquire enough calories and nutrients for a healthy and productive life is pervasive (United Nations Development Programme [UNDP], 2012). This is in spite of ample agricultural land, plenty of water and a generally favourable climate for growing food in Nigeria for example.

The food security situation in Nigeria has improved slightly, though the progress is slow. The FAO (2011b) monitoring report on progress towards hunger reduction targets of the World Food Summit (WFS) and the Nigeria Millennium Development Goals (MDGs) indicate that there was slight increase in per capita daily calorie intake of Nigerians from 2310 kcal between 1990 and1992 to 2560 kcal in 2000/2002 and it increased again to 2710 kcal between 2006 and 2008. Similarly, the number of undernourished people decreased from 16.3 million people between 1990 and 1992 to 11.9 million in 2000/2002 and further declined to 9.4 million people between 2006 and 2008. Furthermore, the report on Nigeria MDGs by the Federal Government of Nigeria (2010) indicates that the proportion of underweight children reduced from 35.7 percent in 1990 to 23.1 percent in 2008, which is less than the regional average of 28 percent for SSA countries.

Despite the improved statistics, Nigeria faces a challenge in meeting the basic food needs of its population. This has been attributed to the neglect of the agricultural sector following the discovery of oil in commercial quantity (Akpan, 2009). Agriculture is the principal source of food and livelihood in Nigeria, and employs nearly three-quarters of the nation's work force (Dayo, Nkonya, Pender & Oni, 2008) but about 90 percent of the produce comes from inefficient small scale rain-fed subsistence farms, constrained by poor infrastructure and little access to credit (IFPRI, 2009). Many of these farms are unable to meet their own subsistence requirements, thereby exposing families to volatile prices in the market.

Since 2006, however, Nigeria's agricultural sector consistently contributed over 40 percent of the nation's GDP, with a growth rate of 7.4, 7.1 and 6.3, 5.9 and 5.7 percent in 2006, 2007, 2008, 2009 and 2010, respectively. Agriculture also accounted for the greatest share of the GDP growth rate, as it contributed 3.1, 3.0, 2.8, 2.5 and 2.4 percentage points in 2006, 2007, 2008, 2009 and 2010, respectively (Central Bank of Nigeria [CBN], 2010). However, while growth did take place, it did not really lead to improved food security. This could be attributed to the fact that the poverty situation in Nigeria is worsening despite the fact that the country's economy is paradoxically growing. The incidence of poverty in Nigeria using the absolute poverty measure increased from 54.7 percent in 2004 to 60.9 percent in 2010. Nationally, the food energy poverty incidence was higher among the poor (52 percent) than the non-poor (48 percent). It was also higher among the rural poor (66.1 percent) than the non-poor (33.9 percent). Overall, the food energy poverty was higher in the northern part of the country than in the south (National Bureau of Statistics [NBS], 2012). Moreover, Nigeria's population was estimated at 168 million people in 2011 (NBS, 2012) making it the eighth most populous nation in the world and is projected to reach about 208 million people by 2025 (USCB, 2012; United Nations Population Division [UNPD], 2011). This has dire consequences for food security in the country, making poverty reduction and hunger a key development challenge in Nigeria.

During periods of food shortages and restricted access to food, households change their daily behaviour to adapt to critical problems (Arimond & Ruel, 2004; Maxwell, 2003). By capturing the different coping strategies that households employ to deal with poor access to food, it is possible to assess and monitor behaviour changes in relation to food shortages.

A number of studies have been carried out in different parts of Nigeria to measure household food (in)security and its determinants, using various methodologies. (Babatunde, Ometesho & Sholotan, 2007; Amaza, Umeh, Helsen & Adejobi, 2006; Obamiro, Droppler & Kormawa, 2006; Ziervogel, Nyong, Osman, Conde & Downing, 2006). These studies showed that between 31% and 52 % of the populations studied was food secure. The studies identified the major determinants of household food security as age, gender, total household income, household size, educational level of household heads, quantity of food obtained from own production, farm size, cash crop grower/non-grower, number of days lost to illness, income group, amount spent on illness, accessibility to market, type of household farm enterprise and labour availability. To our knowledge, no similar studies have been conducted among ethnic groups in North Central Nigeria. This paper reports a study of the food security status of selected ethnic groups, analyzes its determinants and outlines the strategies that people make use of to cope with food stress. Understanding the food security status of the people and the factors that influence them as well as their coping mechanisms are essential to designing more appropriate intervention strategies of development assistance in food security, particularly in times of food stress. Such policies should try to support existing livelihood strategies and widen the space and opportunities for people to survive.

2. Materials and methods

The data reported in this article were part of a large questionnaire survey of the food security situation of households among selected ethnic groups in North Central Nigeria. North Central Nigeria is situated in the southern Guinea savannah agro-ecological zone and consists of six states, namely Plateau, Nasarawa, Benue, Kogi, Niger and Kwara as well as the Federal Capital Territory, Abuja (National Bureau of Statistics, 2005). The region covers a land area of about 251,425 square kilometres (Nigeria Annual Abstract of Statistics, 1996; Nasarawa State Agricultural Development Programme, 2010) with a population of about 20,266,257 inhabitants (National Population Commission, 2009) and has a high degree of ethnic diversity. Among the dominant ethnic groups are Tiv, Igala and Eggon. Subsistence agriculture is the principal activity in the study area. Farms are generally small, usually less than five hectares and rely on the use of manual labour and crude implements such as hoes and machetes. Cattle, sheep, goats, pigs, and poultry are some of the principal livestock kept by farmers in the region.

The survey targeted all the ethnic groups in North Central Nigeria. A multi-stage sampling procedure was adopted for the study. In the first stage, three ethnic groups and one village per ethnic group were purposively selected based on differences in language and culture. In the second stage, 120, 108 and 112 households respectively were randomly selected from each village, making a total of 340 households out of 851 households residing in the study villages. The survey gathered quantitative data pertaining to household socio-economic factors, food security (energy availability) and coping strategies using a questionnaire. Data were analyzed using frequency, percentage, mean score and logit regression.

Food security (energy availability), which is the dependent variable, was measured using the Food Security Index method. Firstly, the households' calorie intake was obtained by requesting the person responsible for food preparation in the household to report the quantities of every food item consumed in the household in the past 24 hours. Secondly, the quantities were converted to grams and the calorie content was estimated using the available food consumption tables (Oguntona & Akinyele, 1995; Smith, 1995; calorie-data.com/foods, 2011). (See appendices 1, 2 & 3). Thirdly, per capita calorie intake was calculated by dividing the estimated total household calorie intake by the number of adult equivalent (AE) in the household using the consumption factor for age-sex categories (Falusi, 1985) (See appendix 4). Based on FAO criteria (as cited in Swindale & Ohri-Vachaspati, 2005) the food security line for Nigeria was 2766 kcal. Consequently, households whose daily per capita calorie supply per AE was equal to or greater than 2766 kcal were regarded as food secure and were assigned a value of 1 while households experiencing a calorie deficit were regarded as food insecure and were assigned a value of 0.

Additionally, the shortfall/surplus index ratio of food security was calculated for the sampled households based on the food security line. The shortfall/surplus index (P) measures the aggregate level, the extent to which households are below (or above) the food security line while the headcount ratio measures the percentage of the population of households that are food insecure/secure.

$$p = \frac{1}{M}\sum_{j=1}^{m} Gj$$

Where:
M= Number of food insecure/food secure households (shortfall/surplus index)
Gj= Per capita calorie intake deficiency or surplus for jth household
Gj= (Xj-1)/1
Headcount ratio (H) =m/N
m= number of food insecure/secure
N = number of households in the sample

Twelve explanatory variables, eight measured as continuous variables and four as discrete, were identified as major socio-economic factors of household food security. These include sex of household head, age of household head, level of education of household head, household size, household total farm size, fertilizer use, credit use, annual output from own production, employment in off-farm activities, farm income , nonfarm income and annual total household income. Except for household size, the remaining eleven factors were *a priori* expected to have a positive impact on food security.

The Logit regression model was used for the analysis of the food security status of households as a function of a set of socio-economic factors (Bamire and Olubode, 2002; Oni, Omonona & Akinseinde (2004). The details of the model for determining the effect of socio-economic variables on household food security are expressed as follow:

$$Z = \ln\frac{p_i}{1-p_i} = \ln = a+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_8+b_9x_{9+}\ b_{10}x_{10+}\ b_{11}x_{911+}\ b_{12}x_{12}$$

Where:
Z = probability of food security (1 = food secure; 0 = food insecure).
bs= coefficients of explanatory variables which increase or decrease z.
X_1 = Sex (dummy).
X_2 = Age (in years) (continuous).
X_3 = Number of years spent in school (continuous).
X_4 = Household size (adjusted). Household size was adjusted for male adult equivalent.
X_5 = Household's total farm size in hectare (continuous).
X_6 = Fertilizer usage in kilogram (continuous).
X_7 = Credit use (dummy).
X_8 = Annual output from own production in kilogram (continuous).
X_9 = Employment in off-farm or non-farm activities (dummy).
X_{10} = Farm income (continuous).
$X_{11=}$ Non farm income (continuous).
X_{12} = Annual total income for household in naira/AE. This includes the annual farm and non-farm income (continuous).

The comparative reduced coping strategies index (RCSI) (Maxwell and Caldwell, 2008) was used to measure the coping strategies employed by households during food stress. The researchers presented the respondents with a list of five coping strategies, which measured only the same set of behaviours for each listed strategy. These strategies are (1) rely on less preferred food, (2) borrow food or rely on help from relatives/friends, (3) limit portion size at meal times, (4) reduce number of meals, and (5) restrict consumption by adults in order for small children to eat. The respondents were asked to indicate what they do when they don't have adequate food or money to buy food and how often (frequency) the household had to use any of the strategies in the past 30 days. The 30-day reference period was used to minimize recall errors and conform to that used by Indonesia Food and Nutrition Security Monitoring System (FNSMS, 2009). The frequency score was based on number of times each strategy was adopted and their severity was based on the seriousness of each strategy in terms of degree of food insecurity that they suggest. The frequency score from individual households was then aggregated and total percentages were compared across ethnic groups. In addition, the frequency score and their severity were combined in a single score to derive CSI. The maximal RCSI is 240 during the past 30 days (i.e. all five strategies are applied every day). The CSI from individual households was aggregated and averages were compared across the three groups to reveal information on the food security status. There are no universal thresholds for CSI but for households reporting food consumption problems, higher CSI indicates a worse food security situation and vice versa (FNSMS, 2009). Similarly, for ethnic group reporting food consumption problems, higher CSI indicates a worse food security situation and vice versa.

3. Results

3.1 Socio-economic characteristics of respondents

The socio-economic characteristics for survey respondents are presented in Table 1. The majority (Tiv- 95%, Igala-87% and Eggon-91.1%) of the household heads were men while a few (Tiv- 5%, Igala-13% and Eggon-8.8%) were women. This finding revealed that male headed households dominated the study area. The household heads of the Igala ethnic group were the oldest (48.85 years) whereas those of the Tiv were the youngest (38.18 years). The mean age of the Tiv household heads was 38.18 years while those for Igala and Eggon were 48.85 years and 43.62 years respectively and the average age for the study was 43.36 years.

The educational status of the household heads revealed that while about 53.2% had no formal education, 46.8% had one form of education or another. Among the Tiv ethnic group, 32.5%, 12.5% and 1.7% had primary, secondary and tertiary education respectively. Of the Igala households, 29 %, 12% and and 0.9% possessed primary, secondary and tertiary education respectively while 25%, 22.4% and 2.7% of the Eggon household heads had primary, secondary and tertiary education.

Household size among Tiv ethnic group ranged between 2 and 14 persons while those of Igala and Eggon ranged between 2 and 17 and 2 and 10 people respectively. However, majority (Tiv-76.7%; Igala-83.3%; Eggon-86.6%) of the respondents had between 2 and 7 persons per household and a mean household size of 5.0 persons for the region.

With respect to farm size, the majority had between 1 and 4 hectares (Tiv-93.3%, Igala-100% and Eggon-92.9%). Farm sizes ranged between 1 and 10 hectares among Tiv, between 1 and 4 hectares among Igala and between 1 and 9 hectares among Eggon. The mean farm size was highest (4.05 ha) in Eggon and lowest (1.96 ha) in Igala households with a grand mean farm size of 3.34 ha for North Central Nigeria.

The study revealed that majority (91.8%) of the respondents had crop outputs of between 300 and 15,299 kilograms annually. The total annual output varied widely ranging between 550 and 35,800 kilograms among the Tiv, between 550 and 35,800 kilograms among the Igala and between 300 and 11,100 kilograms in Eggon. The mean output was 6747.50 kilograms in Tiv, 2372.60 kilograms in Igala and 9072.00 kilograms in Eggon households.

The overall average fertilizer use per hectare per annum was 4.73 kg. However, this varied from ethnic group to ethnic group. The Eggon had the highest mean fertilizer use per hectare of about 9.06 kg per annum followed by Tiv (4.57 kg) while Igala (0.58kg) had the least. In addition, majority (89.4%) of the household heads had no access to farm credit. The limitation on low fertilizer use and little or no access to farm credit for the purchase of vital inputs may have contributed to the low crop outputs by farmers in this study.

The majority (53.2%) of household heads did not participate in non-farm activities. However, about 46.8% engaged in some form of non-farm activities in addition to their primary occupation of farming to meet their food needs. Among those who participated in non-farm activities, the Igala reported the highest involvement (63.8%) while the Eggon (30.4%) reported the lowest participation. The most important activities included petty trading by Igala (30.6%) and motorcycle transportation by Tiv (12.5%) and Eggon (9.8%).

The majority (Tiv-67.7%; Eggon-63.6%) of the respondents had farm income of between 50,000 Naira and 100,000 naira while less than half (Igala-46.4%) earned below 50,000 naira annually. The mean farm income was 86, 219 naira, 38, 743 naira and 81, 364 naira in Tiv, Igala and Eggon households respectively with a grand mean of 69,539 naira for the region. This represents about 81.33%, 54.22% and 84.71% of total income in Tiv, Igala and Eggon respectively with an overall share of 75.79%.

With respect to non-farm income, majority of respondents in Tiv (25.7%) and Igala (44.3%) households earned less than 50,000 naira annually while a small proportion (17.1%) in Eggon earned between 50,000 and 100,000 naira with an average non-farm income of 19, 957.00 naira, 32, 458 naira and 15, 580 naira in for Tiv, Igala and Eggon respectively and a grand mean of 22,486 naira. This represents about 18.83%, 45.23% and 16.22% of total income in Tiv, Igala and Eggon respectively. Overall, non-farm income constituted about 24.51% of the rural income. The finding is consistent with the report of Barret, Reardon and Webb (2001) that rural non-farm income accounts for a considerable share of rural incomes.

The average annual household income for Tiv, Igala and Eggon households was 106, 010, 71, 451 and 96, 051 Nigerian Naira respectively with a grand mean of 91,752 Naira (US$588.15). Farming accounted for 75.79% of the total income whereas off-farm income had an overall share of about 24.51%.

3.2 Indices of household food security

A food security indicator (FSI) provides an estimate based on percentage of households that are food secure or food insecure. The summary statistics and food security indices among the sampled households are presented in Table 2. Based on the recommended FAO daily calorie intake (R) of 2766 kcal, the study found that 67.5% Tiv, 41.7% Igala and 44.6% Eggon households were food secure with an average daily per capita calorie consumption of 3204kcal. Although the aggregate daily household calorie availability exceeded the minimum requirement, the region is only on the threshold of food adequacy. Besides, about 32.5% of Tiv households were food insecure as were 58.3% Igala and 55.4% Eggon with an average daily per capita calorie consumption of 2358.20 kcal. In all, food secure households constituted about 51.8% of the sample. The shortfall/surplus index (P), which shows the extent of deviation from the food security line, showed that the food secure households exceeded the calorie requirement by only 4%, 7% and 2% among Tiv, Igala and Eggon respectively with an average of 2% for the study area. Furthermore, the food insecure households fell short of the recommended calorie intake of 2766 kcal by 14%, 6% and 6% for Tiv, Igala and Eggon, also with an average of 2%. The results imply that an increase in calorie supply for food insecure households by 14%, 6% and 6% among Tiv, Igala and Eggon could lead to food security in the region. The headcount ratio shows that about 68% of the Tiv individuals were food secure while 33% were food insecure. Among Igala, this ratio was 42% secure and 58% insecure and among Eggon 45% of the individuals were food secure whereas 55% were food insecure. About 52% of the individuals in the study area were food secure whereas 48% were food insecure (Table 2).

3.3 Socio-economic factors influencing household food security

Logistic regression was used to determine the relationship between household socio-economic variables and food security. The logistic regression results (Table 3) reveal that four out of the ten variables included in the model were significant in explaining the variation in the food security status of households in North Central Nigeria. These variables are own production ($t= 2.89$; $p \leq 0.05$), farm income ($t= 2.21$), annual income ($t=2.79$; $p \leq 0.05$) and household size ($t=-7.64$; $p \leq 0.05$). Output from own production, farm income and household annual income were positive and significant at 5% level whereas household size was negative and significant also at 5% level.

3.4 Coping strategies utilized by households during food shortage

The study revealed that majority (Tiv=86.7%; Igala= 98.1%; and Eggon= 97.3%) of the households relied on less preferred food as a means of coping with food shortage and about 93.8% of the entire population used this

strategy. Similarly, majority (Tiv =85.8%; Igala= 84.3% and Eggon=80.4%) of the households limit food portions at meal times and 83.5% of the entire population employed this strategy. A reduction in the number of meals per day was high among Igala (46.3%) and Eggon (45.5%) ethnic groups compared to Tiv (31.7%) with about 46.9% of the entire population using this strategy (Table 4). The study also showed that the mean coping strategy index for Igala, Eggon and Tiv ethnic groups were 44.8, 37.5 and 34.4 respectively and 38.5 for the entire population (Table 5), implying that more households in Igala experienced difficulties in obtaining food than Eggon and Tiv.

4. Discussion

4.1 Socio-economic characteristics of respondents

The fact that most households in North Central Nigeria were male headed could be a boost to food security since male-headed households are in a better position to pull more labour force than female-headed ones (Bogale and Shimelis, 2010). The age of the household head determines the level of experience and access a household could have to available resources for agricultural production and food purchases. The study revealed that most household heads were in the productive age group and would be able to make a meaningful impact in agricultural production and as well participate in non-farm activities for improved food security. The study showed that the educational level for the respondents was low. This can affect farmers' capacity to adapt to change or to cope with food production stresses leading to food insecurity among populations (UNCTAD, 2008). In view of the low education level in a region where the main economic base is agriculture, agricultural extension organizations should properly instruct farmers on recommended agronomic practices and farm inputs. In addition, adult literacy programmes should be organized for farmers by adult education agencies to increase their receptivity to new ideas and to promote the dissemination of new techniques.

The mean household size for the region was 5.0 persons. This is similar to the national average of about 5 persons for Nigeria reported by the National Bureau of Statistics (2009). Household size could have implications for supply of farm labour and also for food security. Large household size can supply abundant farm labour, which can be harnessed by the household for increased agricultural production. However, increased family size also tends to exert more pressure on consumption, especially when there are many dependants, particularly children and elderly people.

While the mean farm size among Igala is comparable to the national average of 2 hectares, those in Eggon and Tiv are higher than the national average but consistent with the report of IFPRI (2007) that most farmers in Nigeria are small-scale farmers. Food production is expected to increase extensively through the expansion of the area under cultivation. Although households in the study area obtain their living from agricultural production, most are small-scale subsistence farmers who produce only a little surplus for sale. The domination of agricultural production by small-scale farmers could impact negatively on food security.

Most studies regard fertilizer use as a proxy for technology. Since subsistence farming is production for direct consumption, any input that augments agricultural productivity is expected to boost the overall production, thereby contributing towards attaining household food security. While the mean fertilizer use per hectare by the Eggon is close to the national average of 10-15kg/ha per annum reported by the International Fertilizer Development Corporation (2006) that of the remaining ethnic groups is far below the national average. In general, fertilizer use in the study area was low. The low utilization of fertilizer may be attributed to its scarcity and the high cost of the product prevalent in the region. However, studies by Rutsh (2003) and Smith and Huang (2000) on the role of fertilizer in agricultural production found that fertilization of farmland can boost agricultural production and influence the food security status of households. Thus, restricted access to fertilizer supplies may pose a serious constraint to agricultural productivity growth and food security.

The finding of this study on access to farm credit is consistent with the report of Dayo, Nkonya, Pender and Oni (2009) that many smallholder farmers in Nigeria are unable to access credit due to the issues of collateral and high interest rates as well as the short term and fixed repayment periods for agricultural loans by lending institutions. The limitation on little or lack of access to farm credit and low fertilizer use may have contributed to the wide variation in outputs from farmers' own production and hence a near food insecurity situation in this study. This implies that the region is dominated by farmers who have little or no access to credit facilities to enhance farm production and productivity which could improve food security.

The high degree of involvement of Igala household heads in income generating activities could be attributed to the earlier finding that this ethnic group had the lowest crop output and therefore had to engage in multiple sources of income to raise money for food purchases. Studies have shown that employment in off-farm activities is essential for diversification of the sources of farm households' livelihoods (Kidane, Maetz & Dardel (2006). It also enables households to modernize their production by giving them an opportunity to apply the necessary inputs and it reduces the risk of food shortage during periods of unexpected crop failures through food purchases

(Maxwell & Frankenberger, 1992). Food security could be improved by enhancing farmers' inherent capacities through training and provision of rural infrastructure for effective participation of the poor in related off-farm income generating opportunities such as food processing, petty trading, transportation, livestock keeping, etc.

Although farming accounted for about three quarters of the rural household economy, non-farm income is a significant part of total income; hence it is important for purchasing power and food security. Overall, the study showed that farmers with high crop output are also the higher income earners in the region. This is because the higher the farm crop output the higher the income of farmers, all things being equal. This may however be affected by other market conditions and environmental factors. Such market factors may be the prevailing prices of commodities in local markets and the market schedule within a specified period. Income earned from any source could improve the food security status of the household. Consequently, households that manage to secure larger income from any source could have better access to the food they need than those households which do not.

4.2 Indices of household food security

Although the aggregate household daily calorie availability exceeded the minimum requirement, the region is only on the threshold of food adequacy. This finding is different from those of Omotesho, Adewumi, Muhammad-Lawal & Ayinde (2006), Amaza, Umeh, Helsen & Adejobi (2006) and Babatunde, Omotesho & Sholaton (2007) who reported lower food security status among different populations in Nigeria. The difference could be attributed to the timing of the present study as well as differences in demographic and socio-economic background of the respondents. The fact that close to half of the households studied was subsisting on less than daily per capita calorie requirement is an indication of low agricultural production and diversification of income sources in the region.

4.3 *Socio-economic factors influencing household food security*

The results of the logistic regression for analyzing the determinants of household food security revealed that increase in crop output increases the probability of household food security. This means that the higher the amount of food obtained from the farmers' own production, the higher the likelihood of household food security. This is consistent with the work of Babatunde, *et al.* (2007) which showed that the quantity of food obtained from farmers' own production significantly influences household food security. The finding also revealed that the probability of household food security increases with increase in farm income and total household income. This could be expected because increased income, all things being equal, leads to increased access to food. This finding corroborates that of Omonona, *et al.* (2007) which showed that the level of household income significantly influences food security. Furthermore, this finding indicates that increase in household size decreases the probability of food security. This could also mean that households that are large are more likely to be food insecure than small households. This is consistent with the studies of Amaza, *et al.* (2006), Obamiro, *et al.* (2006) and Agbola, Ikpi & Kormawa (2004) that household size was a factor that significantly influences food insecurity.

4.3 Coping strategies utilized by households during food stress

Overall, households mostly adopted short-term coping strategies to acquire food while seeking to protect their livelihoods. The strategy of relying on less preferred food is less severe compared to that of limiting portion size at meal times as this has particularly severe consequences for child nutrition. The study showed that no single strategy was found sufficient to cushion families against food shocks. Consequently, there were overlaps of the strategies adopted by households to combat food shortage. Although the study revealed that more households in Igala experienced difficulties in obtaining food than those in Tiv and Eggon, the entire population used one form of coping strategy or another to obtain food during food crisis. It must be noted that the use of coping strategies in the study area is a reflection of poor access to food by households. However, the use of coping strategies during food shortage is not restricted to North Central Nigeria but is also practiced by households in other African countries such as Swaziland and Botswana (Tembwe, 2010). Therefore, agricultural extension organizations in North Central Nigeria should target the entire region with food security interventions in order to achieve the first Millennium Development Goal of eradicating extreme poverty and hunger in the region by 2015.

5. Conclusions and Recommendations

The study has shown that small-scale resource poor farmers with low education and little or no access to credit facilities for the purchase of vital inputs, including fertilizer to enhance farm production and productivity, which could improve food security, dominate rural North Central Nigeria. It also revealed that farming accounted for about three quarters of the rural household economy but non-farm income is a significant part of the total income; hence it is important for purchasing power and food security. The study showed that in total, slightly above half (51.8%) of the households investigated were food secure. However, calorie consumption was just at the threshold of adequacy while the use of coping strategies is a reflection of poor access to food by households. Thus, food remained an issue in North Central Nigeria. Socio-economic variables such as household size (AE),

output from own production, farm income and annual household income were found to be important correlates which affect food security. In line with this conclusion, the following recommendations are made:

i. In view of the low education level in a region where the main economic base is agriculture, agricultural extension organizations should properly instruct farmers on recommended agronomic practices and farm inputs. Additionally, adult literacy programmes should be organized for farmers by adult education agencies to increase their receptivity to new ideas and to promote the dissemination of new techniques.
ii. Although some may argue that large households provide farm labour, which compensates for the cost of food and other social needs, this does not automatically improve food security as it is subject to many variables, which are beyond the control of the household. Therefore, rural households in the region should be educated on family planning methods to enable them reduce the number of children they bear or improve child spacing, thereby enhancing food security.
iii. In view of the fact that farming accounted for a larger share of households' incomes, farmers should be provided access to productive resources for increased agricultural production and productivity for food security.
iv. Too often, poverty alleviation and agricultural development programmes/projects and initiatives tend to emphasize agricultural transformation, unaware of and to the detriment of non-farm economic opportunities and livelihoods in rural areas. This leads to mono economy, which results to low income, especially during periods of plenty. There is need, therefore, to encourage income and occupational diversification and value chain in primary products. Households should be assisted to diversify their income sources and enhance their purchasing power so as to meet their minimum food requirements.

References

Agbola, P. O., Ikpi, A. E., Kormawa, P.M. (2004), Factors influencing food insecurity among rural farming households in Africa: Results of analysis from Nigeria. Internet Discussion Paper, November, 2004. [Online] Available from: http/www.pjbs.org/pjnonline/ab577. [Accessed: 18th October 2009].

Akpan, E. O. (2009), Oil resource management and food insecurity in Nigeria. [Online] Available from: http://erd.eui.eu/media/akpan.pdf. [Accessed: 2rd February 2010].

Amaza, P.S., Umeh, J.C., Helsen, J., & Adejobi, A.O. (2006), Determinants and measurement of food insecurity in Nigeria: Some empirical policy guide. [Online] Available from: http://pier1.umn.edu/25357 . [Accessed: 8th April 2009].

Arimond, M. and Ruel, M.T. (2004), Dietary diversity is associated with child nutritional status: Evidence from 11 demographic and health surveys, *Journal of Nutrition* **134**(10), 2579- 2585.

Babatunde, R.O., Omotesho, O.A. and Sholotan, O.S. (2007), Socio-economic characteristics and food security status of farming households in Kwara State, North Central Nigeria, *Pakistan Journal of Nutrition* ***6***(1), 49-58.

Bamire, A.S. & Olubode, O. (2002), Socio-economic determinants of land degradation in Osun State. In: Agricultural Economics in Nigeria, *Proceedings of Nigeria Association of Agricultural Economists 2001 Conference,* 212-217.

Barret, C.B., Reardon, T. and Webb, P. (2001), Non- farm income diversification and household livelihood strategies in rural Africa: concepts, dynamics and policy implications, *Food Policy* **26** (4), 315-331.

Bogale, A. and Shimelis, A. (2010), Household level determinants of food insecurity in rural areas of Dare Dawa, Eastern Ethiopia. [Online] Available from: file:1111/systembiller/shareddocuments/socioeconomic of Ethiopia.htm. [Accessed: 22nd April 2009].

Calories in Palm Oil. [Online] Available from: www.calories in data.com/foods/view/17-039. [Accessed: 2nd February 2011].

Central Bank of Nigeria (CBN) (2010), 2010 annual report. [Online] Available from: www.cbn.gov.ng. [Accessed: 5th June 2011].

Dayo, P., Nkonya, E., Pender, J. and Oni, O.A. (2008), Constraints to increasing agricultural productivity in Nigeria, *Nigeria strategy support program (NSSP) Brief,* 4, 1-3.

Falusi, A.O. (1985), Socio-economic factors influencing food nutrition consumption of urban and rural households. A case study of Ondo State of Nigeria, *Nigerian Journal of Nutrition Science* **6** (2), 52.

Federal Government of Nigeria (FGN) (2010), *Nigeria Millennium Development Goals* (MDGs) Report. [Online] Available from: www.mdgs.gov.ng . [Accessed: 22nd March 2011].

Food and Agriculture organization of the United Nations (2002), The state of food insecurity in the world 2001. [Online] Available from: www.fao.org/docrep/003/y1500e/y1500e.pdf. [Accessed: 3rd May 2009].

Food and Agriculture organization of the United Nations (2010), *The state of food insecurity in the world 2009*. [Online] Available from: http://www.fao.org/docrep/013/i1683e/i1683e.pdf. [Accessed: 4th June 2010].

Food and Agriculture Organization of the United Nations (2011a). *The State of Food Insecurity in the World 2011*. [Online] Available from: http://www.fao.org/docrep/013/i1683e/i1683e.pdf. [Accessed: 7th April 2012].

Food and Agriculture Organization of the United Nations (2011b), Monitoring progress towards hunger reduction targets of the World Food Summit (WFS) and the Nigeria Millennium Development Goals (MDGs), Global statistics service, Rome, Italy.

Food and Nutrition Security Monitoring System (FNSMS) (2009), *Food and Nutrition Security Bulletin*, East Java Province, Indonesia. Issue 1, June- July, 2009, p.9. [Online] Available from: documents.wfp.org/stellent/groups/public/documents/ena/wfp210761.pdf. [Accessed: 12th April 2011].

Gross, R., Schultink, W., & Kielmann, A.A. (1998), Community nutrition: definition and approaches: In Sadler, M., Strain, J.J, Caballero, B. (Eds.), *Encyclopedia of Human Nutrition,* 433-441. London: Academic Press Ltd.

International Fertilizer Development Corporation (IFDC) (2006), Nigeria company reopens only urea in SSA to meet summit call of African Green Revolution. [Online] Available from: www.ifdc.org. [Accessed: 23rd May 2011].

International Food Policy Research Institute (IFPRI) (2007), The world food situation. New driving forces and required actions, *Food policy report*, Washington DC.

International Food Policy Research Institute (IFPRI) (2009), Ensuring food security and nutrition security in Nigeria: An assessment of the challenges, information needs and analytical capacity, *Nigeria strategy support program (NSSP). Background Paper NSSP 007.*

Kidane, W., Maetz, M. and Dardel, P. (2006), Food security and agricultural development in sub-Saharan Africa. Building a case for more public support, Main Report. *Policy Assistance Series* ***2,*** 1-7.

Maxwell, D. (2003), *Urban food security in Sub-Saharan Africa*. International Development Research Centre. [Online] Available from: http://www..idrc.ca/en/ev-30583-201-1-DO- Topic.html. [Accessed: 12th May 2011].

Maxwell, D. & Caldwell, R. (2008). *The coping strategy index: Field methods manual* (2nd ed.) 2-17. [Online] Available from: Wfp.org/stellent/groups/puplic/documents/manual_guide_proced/wfp211058. [Accessed: 12th March 2011].

Maxwell, S. & Frankenberger, T. (1992), Household food security, concepts, indicators, and measurements, Technical review 23. New York and Rome: UNICEF/IFAD. [Online] Available from: http://www.ifad.org/gender/tools/hfs/hfspub. [Accessed: 23rd May 2009].

Nasarawa Agricultural Development Programme (NADP) (2010), *2009* On-Farm Adaptive Research (OFAR) Report. 22nd *Ce*ntral Zonal REFILS Workshop held at Taraba State ADP, Jalingo, March 2010.

National Bureau of Statistics (NBS) (2005). *The Nigerian statistical fact sheets on economic and social development.* Abuja: National Bureau of Statistics.

National Bureau of Statistics (NBS) (2009), *Social Statistics in Nigeria*. Abuja: National Bureau of Statistics.

National Bureau of Statistics (NBS) (2012), *Nigeria Poverty Profile 2010.* Abuja: National Bureau of Statistics.

National Population Commission (NPC) (2009). *2006 National Population Census Official Gazette (Extraordinary,) 94*(4), 52.

Nigeria Annual Abstract of Statistics (1996 edition), Federal Office of Statistics, Lagos, Nigeria.

Obamiro, E.O., Doppler, W., & Kormawa, P.M. (2006), Pillars of food security in rural areas of Nigeria. [Online] Available from:foodafrica.nri.org/security/internet papers/obamiroEunice.doc. [Accessed 23rd April 2012].

Oguntona, E.B., & Akinyele, I.O. (1995). Nutrient composition of commonly eaten foods in Nigeria-raw processed and prepared. *Food basket foundation series*, Ibadan. [Online] Available from: www.nutrientdataconference.org. [Accessed: 12th May 2008].

Omonona, B.T., & Agoi, G.A. (2007), An analysis of food security situation among Nigerian urban households: Evidence from Lagos State, Nigeria, *Journal of Central European Agriculture* ***8***(3), 397-406.

Omotesho, O.A., Adewumi, M.O., Muhammad-Lawal, A., & Ayinde, O.E. (2006), Determinants of food security among the rural farming households in Kwara State, Nigeria, *African Journal of General Agriculture* ***2*** (1), 15.

Oni ,O.A., Omonona, B.T., & Akinseinde, A.A. (2004), Access to credit and food security status of farming households in Lagelu LGA of Oyo State, Nigeria, *BOWEN Journal of Agriculture* ***2***,190-201.

Rutsh, H. (2003), The role of sustainable fertilization-Global food security. [Online] Available from: http://www.un.org/pubs/chronicle/2003/issue3/030. [Accessed: 5th June 2008].

Smith, H., Huang, Y. (2000), Achieving food security in North Korea. Australian National University. [Online] Available from: http://www.mi.infn.it/landnet/corea/proc/039.pdf. [Accessed: 6th August 2009].

Smith, I.F. (1995), The case for indigenous West African food culture. BREDA 9. Dakar Regional Office. [Online] Available from: unesdoc.unesco.org/images/0010/001055/105546E.pdf. [Accessed: 15th September 2010].

Swindale, A. & Ohri-Vachaspati, P. (2005). *Measuring household food consumption: A technical guide*. Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development.

Tembwe, G. (2010), Diet diversity, coping strategies and food access of unemployed young single mothers with children under 9 years of age in Botswana, M.Sc. thesis, University of South Africa, Pretoria.

United Nations Conference on Trade and Development (UNCTAD) (2010), Enhancing food security in Africa through science, technology and innovation, Technology and innovation report 2010, New York and Geneva.

United Nations Development Programme (UNDP) (2012), Toward a Food Secure Future: An overview, *Africa Human Development Report 2012*, Nairobi, Kenya.

United Nations Environment Programme (UNEP) (2002), Africa environment outlook: Past, present and future perspectives. Nairobi. [Online] Available from: earthtrends.wri.org/povlinks/poverty_resource.php? [Accessed 23rd April: 2012].

United Nations Population Division (UNPD) (2011), 2011World CIA Factbook estimate. [Online] Available from: http://en.wikipedia.org/wiki/World_population. [Accessed: 4th May 2012].

United States Census Bureau (USCB) (2012), World PoPClock Projection. [Online] Available from: http:www.census.gov/population/Popclockworld.htm. [Accessed:4th April 2012].

World Hunger Education Service (WHES) (2011), World hunger and poverty facts and statistics. World Hunger Education Service. [Online] Available from: http://www.worldhunger.org/learn/worldhungerfacts2002.htm. [Accessed: 12th May: 2011].

Ziervogel, G., Nyong, A., Osman, B., Conde, C., Cortes, S., & Downing, T. (2006), Climate variability and change: Implications for household food security, *AIACC Working Paper 20.* [Online] Available from: www.aiaccproject.org. [Accessed: 6th August 2009].

First Author: Dr. Mary O. Agada holds a PhD in Agricultural Extension (Rural Sociology) from University of Nigeria, Nsukka in 2012. This paper is part of her PhD Degree Dissertation under the supervision of Prof. Edwin M. Igbokwe of the University of Nigeria, Nsukka, Enugu State, Nigeria. Dr. Agada currently works in the Institute of Food Security, University of Agriculture Makurdi, Nigeria.

Second Author: Prof. Edwin M. Igbokwe is a professor of Agricultural Extension (Rural Sociology) in the Department of Agricultural Extension, University of Nigeria, Nsukka and supervised Dr. Agada's PhD Dissertation.

Appendix 1: Nutrient composition

Food Item	Calorie/kg
Gari	3840
Rice	1230
Cowpea	5920
Melon (shelled)	5670
Groundnut (shelled)	5950
Orange	440
Fish	2230
Meat	2370
Maize	4120
Okra	4550
Cassava flour	3870
Yam	3830
Pepper	3930

Source: Adapted from Oguntola and Akinyele (1995)

Appendix 2: Nutrient composition

Food item	Calorie/100g
Bambaranut	365
Acha (Fonio)	332
Sorghum	339
Millet	431
Beniseed (Sesame)	558
Cocoyam	102
Sweet potato	121
Banana	384.10

Source: Adapted from Smith (1995)

Appendix 3: Nutrient composition

Food item	Calorie/216g
Palm oil	1901

Source: Adapted from calories in data.com/foods/view/17-039

Appendix 4: Equivalent male adult scale weights to determine adjusted household size

Age category	Male	Female
Under 1 year	0.00	0.00
1-4.9 years	0.25	0.20
5-9.9 years	0.60	0.50
10-14.9 years	0.75	0.75
15-59.9 years	1.00	0.90
60 years and above	0.80	0.65

Source: Adapted from Falusi (1985).

Table 1: Distribution of household characteristics across ethnic groups

Category/Variable	Tiv (n= 120)		Igala (n = 108)		Eggon (n = 112)		Pooled (n = 340)	
	%	Mean	%	Mean	%	Mean	%	Mean
Gender								
Male	95.0		87.0		91.1		91.2	
Female	5.0		13.0		8.9		8.8	
Age (yrs)								
< 25	9.9		-		0.9		13.3	
25-45	62.5		40.8		55.6		53.5	
46-66	25.8	**38.18**	54.9	**48.85**	40.2	**43.62**	35.5	**43.36**
67 and above	1.7		4.7		8.0		3.3	
Educational level								
No formal education	53.3		57.4		50.0		53.2	
Primary education	32.5		29.6		25.0		29.1	
Secondary education	12.5		12.0		22.3		15.6	
Tertiary education	1.7		0.9		2.7		1.8	
Household size (AE)								
2 – 7	76.7		83.3		86.6		82.1	
8 – 12	20.0	**5.0**	14.8	**5.0**	13.4	**5.0**	10.2	**5.0**
13 – 17	3.3		0.9		0		1.5	
18 – 23	0		0.9		0		0.3	
Fertilizer Use (kg)								
1- 49.99	0.8		2.8		1.8		0.9	
50-99.99	18.15	**19.58**	-	**1.39**	40.2	**37.68**	19.7	**19.76**
100 and above	10.8		-		14.3		8.6	
Farm size (ha)								
1 -4	70.8		100		67.9		79.2	
5 -8	28.4	**3.96**	-	**1.96**	35.7	**4.05**	20.3	**3.34**
9 and above	8.3		-		0.9		0.6	
Access to credit								
Yes	9.2		4.7		21.4		10.6	
No	90.8		95.4		78.6		89.4	
Output from own production (kg)								
300 – 15299	94.4		99.1		81.3		91.8	
15300 -30299	4.2	**6747.50**	0.9	**2372.60**	17.0	**9072.00**	7.1	**6211.79**
30300 -45299	1.7		0		1.8		0.9	
45300 and above	0		0		0		0.3	
Non-farm activities								
Yes	45.8		64.8		30.4		46.8	
No	54.2		35.2		**69.6**		53.2	
Farm income (N)								
< 50000	13.9		46.4		18.0		34.2	
50001 – 100000	57.7		27.7		**63.6**		51.4	
150001- 200000	4.9		0		1.8		3.0	
> 200000	0		0		0.9		0.3	
Non-farm income (N)								
< 50000	25.7		**44.3**		12.5		27.7	
50001 – 100000	18.3		17.6		17.1		17.8	
100001- 150000	0	**19956.6**	0	**32458.3**	0.9	**15580.36**	0.2	**22486.18**

		7		**3**				
150001- 200000	1.7		2.8		0		0.6	
> 200000	0		1.9		0		0.6	
Annual household income (N)								
< 50000	8.9		**46.2**		16.2		23.5	
50001 – 100000	**43.1**		38.6		**40.5**		43.6	
100001- 150000	34.6	**106010.83**	10.1	**71451.11**	35.8	**96051.25**	24.1	**91752.24**
150001- 200000	12.6		4.5		6.3		6.0	
> 200000	0		0		0.9		2.4	

Table 2: Summary statistics of household food security indices

	Tiv			Igala			Eggon			Pooled		
	[1]FS	FI	All	FS	FI	All	FS	FI	All	FS	FI	All
	67.50	32.50	100	41.67	58.33	100	44.64	55.36	100	51.76	48.24	100
[2]HDCR	10723	20213	20455	12109	16376	28336	9957.6	14365	27055	10860	16529	26261
HDCC	12598	17393	20972	14302	14008	28245	11332	11883	25561	12662	13951	25662
HDPC	3221.2	2432.8	4392.6	3247.9	2358.2	55996	3156.7	2294.8	5724	3204	2358.2	5401.3
C	0	0	0	0	0		0	0			0	0
Z	1.16	0.88	1.588	1.17	0.85	2.0244	1.21	0.86	2.0694	1.16	0.85	1.95
H	0.68	0.33		0.42	0.58		0.45	0.55		0.52	0.48	
Pi		0.14			0.06			0.06			0.02	
Ps	0.04	-		0.09	-		0.07			0.02		

[1]Abbreviations represent: FS= Food security; FI = Food insecurity

[2]Abbreviations represent: HDCR = Household daily calorie requirement (kcal)
HDCC = Household daily calorie consumption (kcal)
HDPCC = Household daily per capita calorie consumption (kcal)
Z = Food security index
H = Head count ratio
P_i = Shortfall index
P_s = Surplus index

Table 3: Regression estimates for determinants of household food security status among ethnic groups in North Central Nigeria

Variables	Coefficients (B)			
	Tiv	Igala	Eggon	Pooled
Sex (X_1)	-1.273661	-0.803957	-0.264340	-0.581119
	(-0.92)	(-0.92)	(-0.31)	(-1.23)
Age (years) (X_2)	0.033047	0.003608	0.019031	0.004065
	(0.75)	(0.13)	(0.61)	(0.30)
Education (years)	0.144503	-0.055047	0.068590	0.012071
(X_3)	(1.28)	(-0.74)	(1.36)	(0.39)
Household size	-1.342917	-0.944090	-1.066242	-0.784679
(AE) (X_4)	(-4.06)	(-4.07)*	(-4.29)*	(-7.64)*
Farm size (ha) (X_5)	-0.014439	-0.219832	-0.012098	-0.008328
	(-0.05)	(-0.52)	(-0.07)	(-0.08)
Fertilizer use	0.008560	-0.041890	0.002482	0.000877
(kg/ha) (X_6)	(1.63)	(-1.40)	(1.09)	(0.68)
Credit Use (X_7)	-2.265100	1.866861	0.061819	-0.029435
	(-1.18)	(1.60)	(0.10)	(-0.06)
Output from own	0.000814	0.000283	0.000385	0.000257
production (kg)	(1.51)	(0.40)	(1.79)	(2.89)*
(X_8)				
Non-farm activities	-1.231834	-0.534569	-0.031515	-0.140374
(X_9)	(-0.97)	(-0.62)	(-0.03)	(-0.33)
Farm income (in	0.000114	0.000097	0.000213	0.000042
naira) (X_{10})	(1.27)	(0.76)	(0.00)	(2.21)*
Nonfarm income	0.000174	-0.000105	-0.000197	-0.000023
(in naira) (X_{11})	(1.84)	(-0.82)	(0.00)	(-1.19)
Annual income (in	-0.000082	0.000145	0.000219	0.000054
naira) (X_{12})	(-0.92)	(1.13)	(0.00)	(2.79)*
Constant	3.967972	3.078871	1.351987	2.244234
	(1.55)	(1.37)	(0.90)	(2.50)
Log likelihood	-2.88947004671	-4.43314154895	-5.34638414736	-1.59693496145

*Significant ($p \leq 0.05$)

Table 4: Percentage distribution of ethnic groups by coping strategies utilized during food stress and mean coping strategy index

Strategy	Tiv (n=120)	Igala (n=108)	Eggon (n=112)	Pooled (n=340)
Rely on less preferred food	86.7	98.1	97.3	93.8
Borrow food or rely on help from friends or relatives	25.8	50.0	30.4	35.0
Limit portion size at meal times	85.8	84.3	80.4	83.5
Restrict consumption by adults in order for small children to eat	25.6	30.6	30.4	28.5
Reduce number of meals eaten in a day	31.7	46.3	45.5	46.9
Mean coping strategy index	**34.4**	**44.8**	**37.5**	**38.5**

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar