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Socio-Economics Characteristics and Food Security Status of Farming Households in Kwara State, North-Central Nigeria

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Abstract: In recent times, the global focus has been on food security and poverty alleviation. This is in response to increasing food insecurity and poverty in the world. The incidences of food insecurity and poverty are particularly devastating in the developing countries and a lot of resources are being channelled towards programmes aimed at eradicating food insecurity and poverty by various international organizations and government of the developing nations. In terms of food insecurity, 852 million people worldwide are still chronically undernourished. In Africa, an estimated 200 million or 27.4% of the people on the continent are undernourished. This figure is expected to increase to 30% by 2010. In Nigeria, over 40% of the estimated population of 133 million people are food insecure. To achieve the Millennium Development Goals of halving the proportion of hungry people by 2015, it was projected that 22 million people must achieve food security every year. In consonance of the above, this study examined the socio-economic characteristics and determinants of the food security status of rural farming households in Kwara State of 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. Descriptive analysis was carried out to describe the socio-economic characteristics of the households. Econometric tools were used to determine factors affecting the food security status of household. Using the recommended calorie required approach; the study revealed that 36% and 64% 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%, while the food insecure households fell short of the recommended calorie intake by 38%. A logit regression model made up of eight regressors was specified. Household income, household size, educational status of household's head and quantity of food obtained from own production were found to determine the food security status of farming households in the study area. It is concluded that the design of food security strategies should be multi-dimensional such that would focus on and address the identified determinants in order to achieve the target set by the Millennium Development Goals.

Key words: Farming household, food security, food insecurity, logistic regression, north central Nigeria

Introduction

In the last decade, attention has been focused on means of eliminating food insecurity and hunger worldwide. The 1992 International Conference on Nutrition and the 1996 World Food Summit both stressed the urgent need to reduce food insecurity and hunger. The 1996 World Food Summit specifically brought back to center-stage in the development debate, the issue of hunger and food insecurity as both the cause and effect of poverty and slow growth. In the wake of this new push, the Millennium Development Goals were launched bringing the international communities to work together to achieve the set goals by 2015 (Migotto *et al*., 2005). The first Millennium Development Goal is to eradicate extreme poverty and hunger. The targets here are to halve between 1990 and 2015, the proportion of people who suffer from extreme hunger and people whose income is less than $1 a day (FAO, 2005). According to FAO (2005), the achievement of these targets is very important to reducing hunger and poverty. This is because it is believed that hunger perpetuates poverty by reducing productivity and poverty in turns prevents people from producing or acquiring the food they need. Less than 10 years to the target year, available statistics still cast doubt on whether this goal could be achieved by 2015.

A progress monitoring report released by FAO (2005), indicated that even though most Millennium Development Goals could be achieved, eliminating hunger and poverty is a pre-requisite for achieving all the other targets of the Millennium Development Goals. Although, the percentage of hungry people in the world has fallen between 1981 and 2001, an estimated 852 million people worldwide are still chronically undernourished; among them are 170 million children under 5 years of age (IFPRI, 2005). The MDGR (2006),

Table 1: Prevalence of under nourishment in the world, 1990-92, 1995-97 and 2001-03

Sub-regions	1990-1992	1995-1997	2001-2003	2015 target
Sub-Saharan Africa	33	34	31	18
Southern Asia	25	23	21	14
CIS, Asia	16	N.A	20	9
Eastern Asia	16	12	12	9
South East Asia	18	14	12	10
Oceania	15	14	12	8
Latin America and Caribbean	13	11	10	7
Western Asia	6	9	9	4
Northern Africa	4	4	4	3
CIS, Europe	4	N.A	3	2.8

Source: MDGR (2006), CIS is Commonwealth of Independent States; N.A is data not available

reported that in 1990, more than 1.2 billion people (28%) of the developing world's population lived in extreme poverty. By 2002, the proportion decreased to 19%. During that period, rate of extreme poverty fell rapidly in Asia, where the number of people living on less than $1 a day dropped by nearly a quarter of a billion people. Progress was not so rapid in Latin America and the Caribbean, which has a larger share of people living in poverty than south-eastern Asia and Oceania. Poverty rates in Western Asia and Northern Africa remained almost unchanged between 1990 and 2002 and increased in the transition economies of southern-eastern Europe and the Commonwealth of Independent States (CIS). These two regions had previously nearly eradicated the worst form of poverty, and survey data suggest that their poverty rates are again dropping.

In Sub-Saharan Africa, although the poverty rate declined marginally, the number of people living in extreme poverty increased by 140 million. Many Sub-Saharan African countries are now showing potentials for long-term growth that could bring up the standard of living (MDGR, 2006). Chronic hunger, measured by the percentage of people lacking the food needed to meet their daily needs has declined in the developing world. However, overall progress is not fast enough to reduce the number of people going hungry, which increased between 1995-1997 and 2001-2003. An estimated 824 million people were affected by chronic hunger in 2003. The worst affected regions were Sub-Saharan Africa and Southern Asia. These regions though have made progress in recent years, their advances have not kept pace with those of the early 1990s and the number of people going hungry is increasing. Of particular concern is Eastern Asia; in the early 1990s, the number of hungry people declined, but again is on the rise (MDGR, 2006). Table 1 shows the proportion of people living in extreme hunger compared with the 2015 target of the Millennium Development Goals across different sub-regions of the world.

In many African countries, food security at both the national and the household level is dismal. Though there are more undernourished individuals in India alone than Africa, it is in Africa that one finds the highest prevalence of under nourishment. Whereas 14% of the Global population is undernourished, 27.4% of the population of Africa as a whole are undernourished (FAO, 2003). In more than a dozen countries, the rate of under nourishment is above 40% while it exceeds 50% in those countries experiencing or emerging from armed conflicts (Todd, 2004). In West Africa sub-region, about 16% of the people are undernourished. The proportion is lower than the regional figure of 27.4%, however, two countries of the West African sub-region-Liberia and Sierra Leone[1] are amongst those with the highest rate of under nourishment in the continent. Table 2 shows the prevalence of under nourishment among West African countries.

In Nigeria, the percentage of food insecure households was reported to be 18% in 1986 and over 40% in 2005 (Sanusi *et al.*, 2006). Although, figures released by Food and Agricultural Organization in 2005 on the state of food insecurity in the world, indicated that 9% of Nigerian population was chronically undernourished between 2000 and 2002 (FAO, 2005). This was less than the regional average of 33% for Sub-Saharan Africa. However, the 9% or about 11 million undernourished Nigerians translate to about 5.4% of total number of undernourished people in Sub-Saharan African as a whole. On the national level, per-capita growth of production of major food items in Nigeria has not been sufficient to satisfy the demand of an increasing population. The result is a big gap between national supply and demand for food. Several reports have been published that show a consistent increased in the production of staple food in the country especially between 1999 and 2005, but there is still an observable gap between food demand and food supply (Sanusi *et al.*, 2006).

The socio-economics characteristics and resources of individual households have been identified as basic factors influencing the food security status of households (Sanusi *et al.*, 2006). Rural households continue to face poor economic conditions which impact on their living standard and food security situation. The returns to land in terms of output have been on the decrease especially where increased population and non-agricultural uses compete for land use. This further creates gaps in resource availability among the poor households. The impact of this is that the food situation gets worse; farms are being abandoned to the elderly or for off-farm jobs. The income from off-farm activities has not been proven to be adequate to meet households' needs (Akinsanmi and Doppler, 2005). This situation requires that the socio-economic conditions are known for a guided change to take place. The particular factors which affect households differently must also be examined and understood. The aim of this paper is to

Table 2: Prevalence of under nourishment among West African countries

Countries	No. of under nourished People (in million)		Proportion of under nourished people in total population	
	1990-1992	2000-2002	1990-1992	2000-2002
Sub-Saharan Africa	170.4	203.5	36	33
West Africa	37.2	36.4	21	16
Benin	1.0	0.9	20	15
Burkina Faso	1.9	2.3	21	19
Cape Verde	N.A	N.A	N.A	N.A
Cote d'Ivoire	2.3	2.2	18	14
Gambia	0.2	0.4	22	27
Ghana	5.8	2.5	37	13
Guinea	2.5	2.1	39	26
Guinea Bissau	N.A	N.A	N.A	N.A
Liberia	0.7	1.4	34	46
Mali	2.7	3.6	29	29
Mauritania	0.3	0.3	15	10
Niger	3.2	3.8	41	34
Nigeria	11.8	11.0	13	9
Senegal	1.8	2.3	23	24
Sierra Leone	1.9	2.3	46	50
Togo	1.2	1.2	33	26

Source: FAO, (2005); N.A means data not available

examine the socio-economics characteristic and food security status of rural farming households in Kwara state, north central zone of Nigeria. The objectives of the paper are to; (1) Measure the food security status of farming households using the 7-days calorie intake recall method. (2) Identify the determinants of food security among farming households. (3) Suggest measures that could help to reduce the level of food insecurity in the area.

Food insecurity in Nigeria: Among the developmental problems facing Nigeria, food insecurity rank topmost. The level of food insecurity has continued to rise steadily since the 1980s. It rose from about 18% in 1986 to about 41% in 2004 (Sanusi *et al.,* 2006). The daily per capita calorie supply as a proportion of recommended requirement was 90% between 1988-90 and 85% between 1992-96 (FOS, 1999). According to FAO (2000), Nigeria was able to reduce the prevalence of under nourishment by more than 30% between 1979-81 and 1996-98. The prevalence dropped from 44% to 8% between these periods[2]. However, the average per capita daily calorie intake remained 2050 kcal during the 1979-81 periods while the diet comprised of 64% cereals and root and tubers (Agboola *et al.,* 2004). National food expenditure data showed that almost two thirds of total expenditure of households in 1980 was on food. This food share rose by about 10% points by 1985, but dropped during the period 1985-1992. In subsequent four year period, 1992-1996, a further drop of 5% points took place. The figures were 63.4%, 74.1%, 72.8% and 63.6% for 1980, 1985, 1992 and 1996 respectively. Also, trends in poverty reveal that the incidence of poverty increased sharply both between 1980 and 1985 and between 1992 and 1996. The figures were 27,2%, 46.3%, 42.7% and 65.6% for 1980, 1985, 1992 and 1996 respectively. The figure for 1996 was translated to 67.1 million (Agboola *et al.,* 2004). The overall national average household income in 1996 prices indicate a very significant downward trend, moving from N13, 454 in 1980 to N6, 252 in 1996, over 50% reduction. The average household in the rural areas earned N5,590 (FAO, 2000).

Agriculture is one of the most important sectors of the Nigerian economy. This is because it contributes more than 30% of the total annual GDP, employs about 70% of the labour force, accounts for over 70% of the non-oil exports and, perhaps most important, provided over 80% of the food needs of the country, (Adegboye, 2004). Given the role of agriculture in the Nigerian economy, food insecurity and poverty could be attributed to the poor performance of the agricultural sector, which in turns creates food availability and accessibility problems at the household and national levels. In other words, the poor performance of the sector directly creates supply shortages and indirectly creates demand shortages by denying the households access to sufficient income. As the food situation in Nigeria worsened after the 1960s, a number of agricultural development institutions were set up and special programmes and projects were launched, these include: National Accelerated Food Production Programme, NAFPP (1973); Agricultural Development Project, ADP (1975); Operation Feed the Nation, OFN (1976); River Basin Development Authorities, RBDA (1977); National Seed Service, NSS (1977); Agricultural Credit Guarantee Scheme, ACGS (1977); Rural Banking Scheme, RBS (1977); Green Revolution, GR (1979); Directorate of Food Road and Rural Infrastructure, DFRRI (1986); National Agricultural Land Development Authority, NALDA (1992); National

Fadama Development Project, NFDP (1992); Nigerian Agricultural Cooperatives and Rural Development Bank, NACRDB (2000); National Agricultural Development Fund, NADF (2002); National Special Programme on Food Security, NSPFS (2002); Commodity Marketing and Development Companies, CMDC (2003). However, according to Idachaba (2004), empirical records of many of these programmes and projects are not impressive enough to bring about the expected transformation of the sector.

Recently however, Nigeria made some progress in the areas of per capita daily calorie intake and the proportion of under nourished people. The average national per capita daily calorie intake increased from 2050 kcal in 1979-81 to 2430 kcal in 1989-91 and to 2700 kcal in 2000-02. Though cereals and root and tubers accounted for 65.3% of the diet in 2000-02 compared to 64% in 1979-81 period (FAO, 2004). The figure represents an 11% increase in per capita daily calorie intake between 1991 and 2002. Also the proportion of under-nourished people decreases from 13% in 1990-92 to 9% in 2000-02 (FAO, 2005). The poverty level according to Kpakol (2005), also fell from 70.8% in 2003 to 54% in 2005.

Conceptual framework of household food Security: Food security has been defined as a situation when all people, at all times, have physical and economic access to sufficient, save and nutritious food needed to maintain a healthy and active life (FAO, 1996). This definition implies that food security is a broad concept that is more than food production and food accessibility. In reality it revolves round four pillars namely, food availability, food accessibility, nutritional factors and stability of food supply (Gross *et al.,* 1999). Fig. 1 shows the elements of food and nutrition security. The implication of this definition is that, achieving food security requires that the aggregate availability of physical supplies of food is sufficient, that households have access to those food supplies through their own production, through the markets (given sufficient purchasing power) or through other sources, and that the utilization of those food supplies is appropriate to meet the specific dietary needs of individuals households or individuals in the households. Fig. 2 shows the framework of food and nutrition security. Food accessibility is ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods for a nutritious diet. It is dependent on the level of household's resources-capital, labour and knowledge and prices.

Materials and Methods

The study area: This study was conducted in Kwara state in the north-central zone of Nigeria. Nigeria, presently made up of 36 states is divided into six geo-political zones for political, agricultural, industrial and educational planning. These zones are; north central[3], northwest, northeast, southwest, southeast and south. The north-central zone is under the moist savannah agro-ecological zone. The state lies between latitude 7° 15′ and 6° 18′ N of the equator. The state shares boundaries with Osun, Oyo, Ondo, Kogi, Niger and Ekiti states. It shares an international boundary with the Republic of Benin. The state presently comprises of sixteen Local Government Areas. A humid tropical climate prevails over the state and it has two distinct seasons; the wet and dry seasons. The wet season last between April and October during which there is rain and the dry season with no rain is between November and March. The rainfall ranges between 50.8mm during the driest months to 2413.3mm in the wettest months. The minimum average temperature throughout the state ranges between 21.1°C and 25.0°C while, maximum averages temperature ranges from 30°C to 35°C. The state is primarily agrarian with great expanse of arable land and rich fertile soils.

The typical cropping systems in the state are maize-based system, yam-based system, cassava-based system and rice cultivation in areas located along river Niger, the major river in the state. The major crops cultivated in the state include yam, maize, cassava, groundnut, cowpeas, sorghum, melon, okra, pepper and some leafy vegetables. Majority of the food produced are eaten, while some households sell small amount of the food in the market to earn additional income for household upkeep. Some households grow cash crops such as cashew, palm oil and rice (KWADP, 1996).The total estimated population of the state is about 2.2 million people in 2004 out of which farmers account for about 70%. The state has a total land area of about 32,500km^2, which is about 3.5% of the total land area of the country, which is put at 923,770km^2 (FAO, 1995). Approximately 25% of the land area of Kwara State is use for farming. The average population density of the state as at 2004 was about 68 people per square kilometer. Agricultural production is largely peasant and small-scale relying heavily on the use of manual labour equipped with crude implements, while fertilizers, mechanical implement, improved seeds and agrochemicals are also used to some extent. Landholding in the state is very small and most of the households have less than two hectares of land for farming. The output from this land is low and most households have to buy food when what they produce from their own land is finished. Some of the rural households also engage in off-farm wage or self-employment to supplement their household's income.

Data source and sampling procedure: The data for this study were obtained from a sample survey of farming households conducted in 2005 in Kwara State of Nigeria. A three-stage random sampling technique was

used to select a sample of 94 farming households from twelve villages across four local government areas of Kwara State. The survey instrument was designed to gather general information about household's characteristics, food consumption and expenditure and non-food consumption and expenditure.

Analytical techniques and variables measurement: To identify the determinants of the food security status of farming households, we carry out two stages of analyses; one, we constructed a food security Index (Z) and determine the food security status of each household based on the food security line using the recommended daily calorie required approach and second, we used the Logit regression model to estimate the food security status of households as a function of a set of independent determinants. A household whose daily per capita calorie intake is up to 2260 kcal was regarded as food secures and those below 2260 kcal were regarded as food insecure households.

$$Zi = Yi / R \quad (1)$$

Zi = food security status of ith households which take values 1 for food secure households or 0 for food insecure households.
Yi = daily per capita calorie intake of ith household
R = recommended per capita daily calorie intake (2260Kcal)
Zi = 1 for Yi greater than or equal to R
Zi = 0 for Yi less than R

Based on the household food security status (Z), the Logit model was estimated to identify the determinants of food security among farm households. The implicit form of the model was expressed as:

$$Zi = \beta Xi + Ui \quad (2)$$

Zi = the food security status of ith household
Xi = vector of explanatory variables
Ui = the error term
β = vector of the parameter estimates

The dependent variable and the explanatory variables that were included in the model are:

Food security: Two objective methods of food security measurement have been widely used in most food security studies (Maxwell, 1996). One is to estimate gross household production and purchases over time, estimate the growth or depletion of food stocks held over that period of time and presume that the food that has come into the households possession and "disappeared" has been consumed. The other method is to undertake food consumption recall for individual members of a household or for the household as a whole and analyze each type of food mentioned for calorie content. In this study, a 7-day recall method was used. The food security line was the recommended daily per capita calorie intake of 2260 kcal. The household's calorie intake was obtained through the household's consumption and expenditure data. From the data we estimated the quantity of every food items consumed by the households in the 7 days period. The quantities were converted to gram and the calorie content was estimated by using the nutrient composition table of commonly eaten food in Nigeria (Appendix 1). Per capita calorie intake was calculated by dividing estimated total household calorie intake by the family size after adjusting for adult equivalent using the consumption factors for age-sex categories (Appendix 2). To get the household's daily per capita calorie intake we divided the household's per capita calorie intake by seven. A household whose daily per capita calorie intake is up to 2260 kcal was regarded as food secure and those below 2260 kcal were regarded as food insecure households. The food security status is bivariate, taking the value 1 for food secure households and 0 for food insecure households.

Household income (X_1): This refers to the sum total of the earnings of the household in a year from farm and off-farm sources. The income is expected to boost household's food production and also access to more quantity and quality food. The expected effect of this variable (β_1) on food security is positive

Farm size (X_2): Farm size is the total farmland cultivated by the household measured in hectares. The larger the farm size, the higher the production level. It is thus expected that households with larger farm size are more likely to be food secure than those with smaller farm size. The expected effect on food security (β_2) is positive.

Membership of cooperatives (X_3): Cooperatives are vehicle for development in the rural areas. Access to cooperative loans depends on membership of the society and it is expected that access to credit should increase household's income, food production and food consumption. Membership of a society = 1 and non-membership = 0, the expected effect on food security (β_3) is positive.

Quantity of food from own production (X_4): This is the total quantity of food output by the household from their own farm measured in kilogram grain equivalent. It consists of both food and cash crop outputs. Cash crops are included because, money realised from their sale could be used to buy staple food for household's consumption. The expected effect on food security (β_4) is positive.

Access to consumption credit (X_5): This is the ability of the household to obtain credit for household's consumption. This could be from cooperatives, government, friends and relatives and moneylenders. Consumption credit could increase household income in the short run and could allow it to possess and consume more food. Households that have access to consumption credit in the last one year are coded =1 and those without access = 0, the expected effect on food security (β_5) is positive.

Age of household head (X_6): The age of household's head in year is expected to have impact on his labour supply for food production. It is also expected to have impact on ability to seek and obtain off-farm jobs and income, which could increase household income. Young people are stronger and are expected to cultivate larger-size farm than old people. However, the expected effect of age on food security (β_6) could be positive or negative.

Educational status of household head (X_7): Education is a social capital, which could impact positively on household ability to take good and well-informed production and nutritional decisions. Some scholars have argued that spouse education could be more important in food security than household's head educational status. Household head that are educated = 1 and those not educated = 0, the expected effect on food security (β_7) is positive.

Household size (X_8): The number of adult individual members in the household measures household size. Since food requirements increase with the number of persons in a household, the expected effect (β_8) is negative.

Additionally, the shortfall/surplus index and the headcount ratio of food security were calculated for the sampled households based on the food security line. The shortfall index (P) measures the extent to which poor households are food insecure while the headcount ratio (H) measures the percentage of the population of household that are food insecure/secure.

$$\text{Shortfall Index (P)} = \frac{1}{M}\sum_{i}^{m} G_i \qquad (3)$$

Where:

M = number of food insecure households

Gi = per capita calorie intake deficiency for ith household

$$G_i = (Yi - R) / R \qquad (4)$$

$$\text{Headcount Index (H)} = M / N \qquad (5)$$

N = the number of households in the sample

Results and Discussion

Socio-economic description of farm households: The human resources available to the farm household determine the minimum level of subsistence and cash requirement (Akinsanmi and Doppler, 2005). The educational level in the area is low which limits opportunity for better off-farm jobs. 52.1% have one form of education or the other ranging from primary education- 10.6%, secondary education -4.3%, Arabic education -37.2%. About 47.9% of the household head have no education at all. The summary of the socio-economic characteristics of the household is presented in Table 3.

The household size could have great implications for labour supply for farm work and also food security. A large household is expected to cultivate large farm size, but the contrary is also possible especially when there are many children dependants and elderly people in the family. The average household size was 7.34 and more than half of the households have between 1 and 5 people. In a country where access to land by women is still very low, the few household's head that were female could be facing problems in securing agricultural land. The average age of household's head was 50 years and 11% of the heads were over 65 years of age. This result probably shows that majority (89%) of the farming population were young and in the active age group. Nonetheless, this was not reflected in the average farm size cultivated as 97.5% of the farmers cultivated between 0.1 and 2.5 hectares of land. Only 2.5% cultivated more than 2.5 hectares.

Access to consumption credit and membership of cooperatives are factors that could increase household's income *ceteris paribus,* however, the result shows that only 14.8% of the farm households had access to consumption credit and 6.4% were member of cooperatives. This situation has negative impacts on household's income and food demand in the short and long run. The total household income was converted into average monthly income and the mean was N5,180 which is equivalent to about $43. This translates to $1.4 per day and $0.2 per adult person per day in the area[4].

Food security indices of households: Based on the recommended daily calorie intake (R) of 2260 Kcal, it was observed that 37.2% of the households were food secure and 62.8% were food insecure. Table 4 presents the summary statistics and food security indices among the sampled households.

Table 4 shows that the study area could be regarded as food insecure given the fact that only 36% of the population were able to meet the recommended calorie intake of 2260 Kcal per capita per day, while 64% could not. The shortfall/surplus index (P) which measures the extent of deviation from the food security line, show that the food secure households exceeded the calorie

Table 3: Descriptive Statistics of Farm Households in the Study Area

Variables	Frequency (N = 94)	Percentage
Gender of household head		
Male	85	90.4
Female	9	9.6
Age of household head		
18 - 65	84	89.0
> 65	10	11.0
Household size		
1 - 5	52	55.1
6-10	31	32.9
>10	11	12.0
Farm size		
0.1- 2.5	92	97.5
>2.5	2	2.5
Education of household head		
Tertiary education	0	0
Secondary education	4	4.3
Primary education	10	10.6
Arabic education	35	37.2
No education	45	47.9
Household income		
N20,000 - N80,000	46	48.8
N80,001 - N200,000	42	44.5
> N200,000	6	6.7
Membership of cooperatives		
Members	6	6.4
Non-member	88	93.6
Access to consumption credit		
Have access	14	14.8
No access	80	85.2

Source: field survey, 2005

Table 4: Summary Statistics of Food Security Indices for the Study Area

Variables	Mean		
Food Security Indices	Food Secure	Food Insecure	All
Recommended per capita daily calorie intake (R) is 2260 Kilocalorie			
Percentage of households	37.2	62.8	100
Number of households	35	59	94
Age of household head	46.6	53.2	50
Household size (Adult equivalent)	6.26	8.98	7.34
Household monthly income	N5,964	N4,215	N5,180
Farm size	1.16	0.87	1.02
Food Security Index (Z)			
Mean	1.41	0.62	0.92
Std	0.35	0.22	0.47
Per capita daily calorie availability	3269	1318	2021
Shortfall/surplus Index (P)	0.42	0.32	-
Head count ratio (H)	0.36	0.64	-

-Source: Computed from Field Survey, 2005

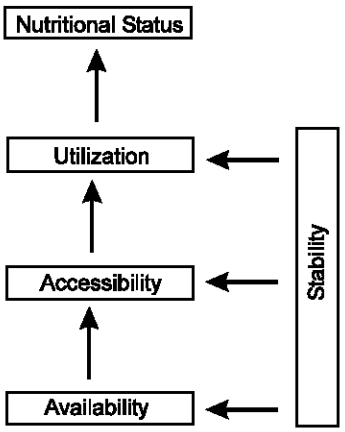
requirement by 42%, while the food insecure households feel short of the calorie requirement by 38%.

Determinants of the food security status of households in the study area: Analysis of the survey data revealed that four out of the eight variables included in the model were significant in explaining the variation in the food security status of households in the study area. These variables are total households income, quantity of food from own production, educational status of household head and household size. The result of the estimation of the Logistic model is presented in table 5.

Table 5: Regression Estimates for Determinants of Food Security Status of Households.

Variables	Coefficients	t-statistics
Constant	-5.060	0.999
Households monthly income	0.488	6.104**
Farm size	-0.498	0.558
Membership of cooperatives	3.959	0.759
Quantity of food from own production	0.001	12.801**
Access to consumption credit	-0.230	0.139
Age of household head	-0.44	1.810*
Educational status of household head	1.334	4.050**
Household size	-0.310	7.069

**Source: Computed from Field Survey Data, 2005; Dependent variable: food security status Asterisks **indicate significant at 5% level;
*indicates significant at 10% level



Source: Gross *et al.*, 1999

Fig. 1: Elements of Food and Nutrition Security

Household income: This variable was positive and significant at 5% level. This indicates that the higher the household income, the higher is the probability that the household would be food secure. This could be expected because increased income, other things being equal, means increased access to food.

Quantity of food from own production: This variable has a low but positive coefficient that was significant at 5% level. This indicates that the higher the amount of food obtained from own production, the higher the likelihood of food security.

Education status of household head: This variable was found to be positive and significant at 5% level. This implies that households with an educated head are more likely to be food secure than one with an uneducated head.

Household size: This variable has a negative coefficient

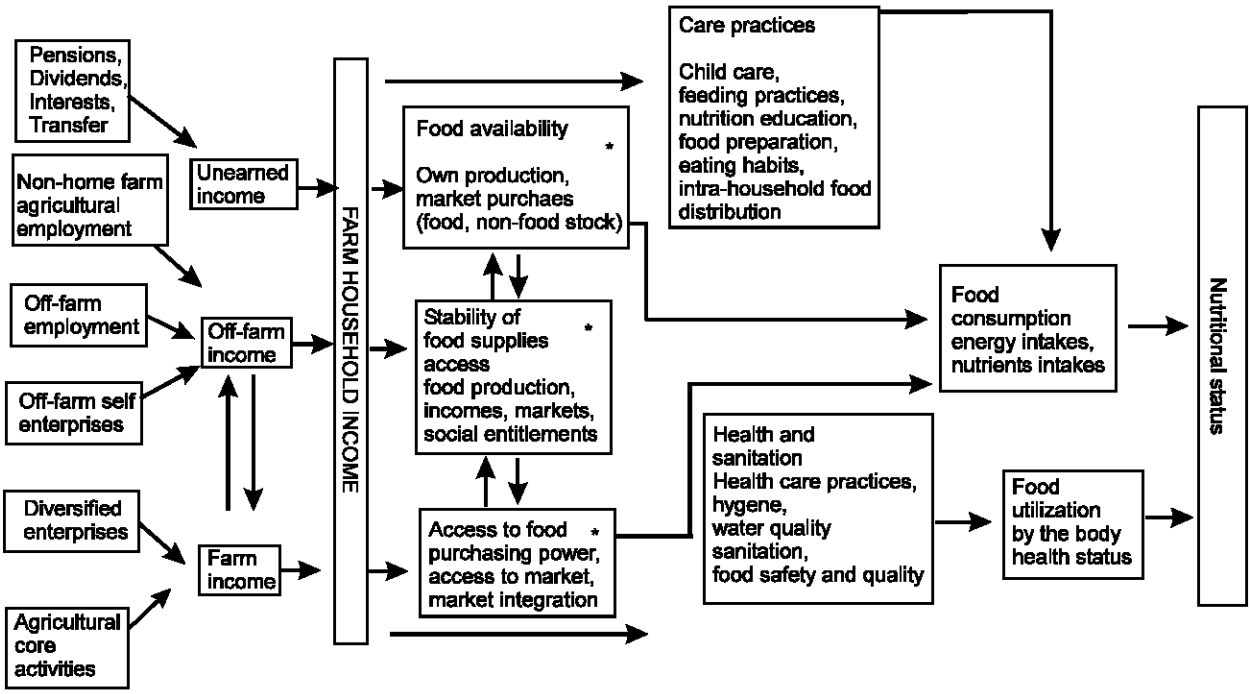


Fig. 2: Conceptual Framework of Household Food Security

that is significant at 5% level, implying that as the household size gets larger, the probability of food security decreases. In another language, large size households are more likely to be food insecure than small size households.

Other variables: The age of the household head, has a negative coefficient that was significant at 10% level. This probably indicates that the older the household head, the lower the probability that the household would be food secure. The coefficient of farm size was negative but not significant. The negative coefficient was contrary to expectation, and this could be due to reason such as inefficiency in the use of land resources. Membership of cooperatives has a positive coefficient, which though not significant, but agrees with a priori expectation. The coefficient of access to consumption credit was negative and not significant. This is not in agreement with expectation and could probably be as a result of non utilization of consumption credit for the purpose it was meant for.

Conclusion and recommendations: This paper has shown that the socio-economic variables of the farm households are important determinants of their food security or insecurity status. The paper showed that household's income, quantity of food from own production, education of household's head and the household's size are important determinants of food security among rural households. It further showed that majority of the households were headed by men (85%) while women headed only 9%. About 89% of the household heads were less than 65 years of age. This was expected to probably allow the young farmers to cultivate large hectare of land, however, the average farm size showed that 97.5% cultivated between 0.1 and 2.5 hectare of land. The average household's size was approximately 7 people and about 44.9% of the household have more than 5 people in their household. Among the 52.1% of the household heads that have education, none had tertiary education and 47.9% had no formal education at all. This low level of education among household has impacts on their nutrition and food security, since the study also showed that household's head education is one of the significant determinants of food security.

Household income, which was identified as one of the significant determinants of food security, was very low in the study area. The average monthly income was N5,180 and this translates to an average adult income of $0.2 per day, even lower than the $1 poverty line. Cooperatives membership was low as only 6% of the households' head were members. Given the role of cooperatives in rural development generally and agricultural development specifically, the introduction and promotion of cooperatives organization should be

Appendix 1: Calorie content of some commonly eaten food items in Nigeria

Food items	Kcal/kg	Food items	Kcal/kg
Staple foods		Mango	590
Cassava Tuber	1500	Pawpaw	300
Cassava flour	3870	Pineapple	320
Cassava chips	3000	Apple	570
Garri	3840	Coconut	580
Yam Tuber	1100	Guava	730
Yam flour	3810	Sugar cane	360
Yam chips	3000	Meat and animal products	
Sweet potato Tuber	1100	Cow meat	2370
Sweet potato chips	900	Goat meat	2370
Irish potato	1200	Sheep meat	2370
Cocoyam Tuber	3830	Pork	2370
Maize green	3100	Bush meat	2370
Maize grain	4120	Chicken	2380
Maize flour	4120	Turkey	2380
Sorghum grain	3500	Fish	2230
Sorghum Flour	3500	Snail	2245
Millet grain	3500	Shrimps	2230
Millet flour	3500	Crayfish	2200
Rice	1230	Crabs	2200
Wheat grain	3400	Eggs (pieces)	1400
Wheat flour	3300	Dairy products	
Cowpea (beans)	5920	Milk	4900
Ground nut	5950	Cheese	4000
Soybeans	4050	Yoghurt	4100
Soybean flour	2600	Ice cream	4100
Melon (shelled)	5670	Beverages	
Plantain	770	Cocoa	1200
Banana	960	Tea (leaves)	1200
Vegetables		Tea (liquid)	1200
Okra	4550	Coffee (powder)	1340
Tomato	880	Coffee (liquid)	1340
Pepper	3930	Drinks	
Onion	440	Soft drinks	620
Carrot	400	Orange juice	400
Egg plant	440	Apple juice	550
Cucumber	270	Pineapple juice	560
Cochorus/ewedu	500	Local beer	740
Spinach	220	Bottled beer	460
Bitter leaf	220	Wine	330
Water leaf	180	Condiments and spices	
Cabbage	230	Maggi	220
Pumpkin	440	Salt	180

Appendix 2: Adult equivalent scale for adjusting the household size

Age category	Male	Female
0 – 1	0.33	0.33
1 – 2	0.46	0.46
2 – 3	0.54	0.54
3 – 5	0.62	0.62
5 – 7	0.74	0.70
7 – 10	0.84	0.72
10 – 12	0.88	0.78
12 – 14	0.96	0.84
14 – 16	1.06	0.86
16 – 18	1.14	0.86
18 – 30	1.04	0.80
30 – 60	1.00	0.82
> 60	0.84	0.74

Source: Stefan and Pramila, (1998)

given adequate priority by government and intervention agencies. Household's access to consumption credit should also be given adequate attention, as 85.2% of the households have no access from any source, to consumption credit.

The food security indices estimated in this study, in our opinion, is a fair representation of the extent and dimension of food security/insecurity in this part of the country. It could serve as reference benchmark with which food security measures elsewhere in the country could be compared-especially against the background of recently launched agricultural programmes such as the National Special Programme on Food Security and the National Fadama Development Projects Phase II. To achieve the Millennium Development Goal of eradicating hunger in Nigeria, it is recommended that food security strategies should be designed in a way that would focus on and address the identified determinants.

Specifically, government and farmers group should provide agricultural inputs to farming households at

affordable prices to be able to increase farm size and food production since own food production was one of the significant determinants of food security in the area. In addition efforts that could boost households' income generation should be promoted. For example, the provision of village infrastructures like motor able road, water, electricity, telephone etc could increase the possibility of off-farm activities that could generate more income for the households.

Enlightment programmes on health education and birth control measures should be directed at the farming households. This is to reduce the risk of consuming unbalanced diets and large family size observed in the area, which could have effects on households' food security. Reducing the negative impact of middlemen who buy food cheaply from farmers but in turn sell at prohibitive price even to the farmers from whom they buy the food should enhance the access to market by rural households. Market access could also be improved by provision of good rural transportation system that would assist farmers to convey their farm produce to the market at cheaper cost.

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[1]Both countries have suffered long-lasting armed conflicts that have undermined the well-being of the people leading to extreme hunger and poverty (Flores, 2004).

[2]An important factor for this was the rapid increase in the supply of cassava products during the period, which benefited mostly the poor and under nourished people.

[3]In the north-central zone, there are six states namely, Kwara, Kogi, Niger, Nassarawa, Plateau and Benue.

[4]As at 2005 and 2006 the exchange rate was N120 to One US dollar