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FOOD SECURITY STATUS OF RURAL FARMING HOUSEHOLDS IN IWO, AYEDIRE AND AYEDAADE LOCAL GOVERNMENT AREAS OF OSUN STATE, SOUTH-WESTERN NIGERIA

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ABSTRACT

This research work reports on the food security status of rural farming households in selected Local Government Areas (LGA's) of Osun State in the South-west Geo-political zone of Nigeria. The objectives were to estimate extent and magnitude of food insecurity in the study area and determine factors that affect household food security. Three of the thirty LGA's were selected using stratified random sampling method, based on the geographical location, extent and number of rural population and variations in the socio-economic characteristics of households. The LGA's were Iwo, Ayedaade and Ayedire. Fifty rural households were then selected from each of the local governments using the random sampling method. One hundred and fifty copies of the questionnaire were administered out of which 103 fully completed and certified responses were used as representative samples for the study area. Food security status of the households was analyzed based on the calorie requirement for all household members. The food security measures applied in this research were Head Count Method, Food Insecurity Gap and Squared Food Insecurity Gap to capture successively more detailed aspects of the food insecurity status of the households. It was found that majority of the rural farming households in the area were food insecure as most of them subsist below the food security line which is 2,280 Kcal in this study. Using the recommended calorie approach, it was discovered that 69.9% of the population were food insecure. In comparison to food insecure households, food secure households have a small family size, earn a high monthly income and make use of modern farm inputs. It is, therefore, advised that food security policy strategies to be put in place by the government should consider the socio-economic characteristics of households in order to achieve more than a marginal reduction in the number of food insecure households.

Key words*:* Households, Rural, Food, Index, Insecurity-gap

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INTRODUCTION

Improved food security is important for global reduction of hunger and for economic development [1]. In the year 2000, world leaders committed themselves to the Millennium Development Goals (MDGs) and one of their aims is to eradicate poverty and hunger, and "reduce by half the proportion of people who suffer from hunger" between 1990 and 2015[2]. Currently, 820 million people are affected by hunger in developing countries and the number of hungry people in the world is growing at an alarming rate of four million a year; this trend is not falling quickly enough to achieve the food security goals particularly in Africa and southern Asia [3].

Despite the growing world abundance of food, food-related crises continue to occur. Differences in food security statuses within countries are common, even if the country has sufficient food in aggregate during normal periods. There have been increased observations of inequalities in the sufficiency of food intake by certain groups despite overall adequacy of supply. However, since the World Food Conference of 1974, the focus on the topic "Food security" has moved from a global and national perspective to that of households and individuals [4]. Food security as a complex and multidimensional phenomenon alongside poverty is nowadays defined as "A situation when all people at all times have physical and economic access to safe, efficient and nutritious food needed to maintain a healthy and active life" [5,6]. Nord and Hopwood also defined it as "An access by all people at all times to enough food for an active life" [7].

Food insecurity is closely linked with poverty [8]. The average income and poverty measures, however, do not provide clear information about food security [9]. It may, therefore, be incorrect to assume that a state, country, region, community or household's poverty prevalence rate is the same as its food insecurity or hunger prevalence rate, since the relationship between poverty and food insecurity is not a consistent one [10]. A wider definition of food security incorporates quality of life indicators. Accordingly, food security implies livelihood security at the level of each household and all members within, and it involves ensuring both physical and economic access to a balanced diet, safe drinking water, environmental sanitation, primary education and basic health care [11]. An important aspect of the wealth of a nation is its ability to make food available and accessible to its populace. The social and economic development of a nation is dependent on the quality of its human and non-human resources. The productivity of a nation's human resources is, however, a function of how well fed the citizens are and how healthy they are at all times [12].

In Nigeria, the percentage of food insecure households was reported to be 18% in 1986 and over 40% in 2005 [13]. Howbeit, figures released by Food and Agricultural Organization in 2005 on the state of food insecurity in the world indicated that about 29% of the Nigerian population was chronically undernourished between 2000 and 2002 [14]. This was less than the regional average of 33% for sub-Saharan Africa. However, the 29% or about 40 million undernourished Nigerians translate to about 5.4% of total number of undernourished people in sub-Saharan Africa as a whole. At

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the national level, per-capita growth production of major food items in Nigeria has not been sufficient to satisfy the demand of an ever-increasing population. The result is a big gap between national supply and demand for food [13]. The socio-economic characteristics and resources of individual households have been identified as basic factors influencing the food security status of households [13].

However, a downward trend was observed from 1991. This has persisted ever since. Food importation has rather been on the increase with sustained decline in domestic production. This was the period of 'essential commodity' and the beginning of massive corruption which permeated various sectors of the economy. During this period, the Fadama development project was introduced in 1992. It, however, did not make sufficient impact. With the democratic government in place from 1999 to-date, various governments have initiated some policies and programmes, which had impacted positively on the agricultural sector. Such programmes include National Agricultural Development Fund (NADF) and National Special Programme on Food Security (NSPFS). Statistics from the FAO and IFPRI survey show slight increase in per capita daily calorie intake from 2,050 Kcal in 1971-1981 to 2,430 Kcal in 1989-1991 and daily calorie intake also between 1991 and 2004 being 2,800 Kcal in 2002-2004. Similarly, the proportion of undernourished people declined from 13 per cent in 1990-1992 to 9 per cent in 2000-2002 and 7 per cent in 2002-2004 [14]. Despite these increases, however, shortfalls in local food supply have persisted. These shortfalls are filled through food imports, ranging in value from 3.47 billion Naira (₦) which was an equivalent of 0.023 billion US Dollars in 1990, to ₦113.64 billion in 2000 [15]. Import of food and live animals was ₦144.29 (0.962USD) billion in 2004 and increased to ₦201.65 billion in 2005 but declined in 2006 to ₦174.23 billion [15]. The food crisis in 2008 in Nigeria caused the government to import about 500,000 tons of rice [16]. On the whole, despite all the improved statistics and government efforts, not less than 65 percent of Nigerians are food insecure [17]. On the basis of this background, the study is aimed at analyzing the food security status of rural farming households in selected areas of Osun State, in the South-Western part of Nigeria. The specific objectives are to estimate the extent and magnitude of food insecurity in the study area and to determine the factors affecting household food security in the area.

RESEARCH METHODOLOGY

The study area, Osun state of Nigeria is located in the South-Western part of the country. Three of the thirty local government areas (LGA's) were selected from the state using stratified random sampling method, based on the geographical location, extent and number of rural population and variations in the socio-economic characteristics of households. The LGAs are Iwo, Ayedaade and Ayedire. Fifty rural households were then selected from each local government using the random sampling method. Out of 150 copies of the questionnaire that were administered, 103 fully completed responses were used as representative samples for the study area.

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In the field of nutrition, food security is measured in two ways. The first one is based on calorie consumption per equivalent male adult [18]. Secondly, it could be by calorie consumption based on age and sex without converting to equivalent male adult [19]. The recommended daily calorie intake defines the food security line and consumption below the minimum level of calorie requirement indicates food insecurity. Taking this into account, a food security index was constructed for the purpose of this study and the food security status of each household was determined based on the food security line using the recommended daily calorie intake (2,850 Kcal/day) by the Food and Agriculture Organization (FAO) after the conversion of all household members' calorie intake into adult equivalent [20, 21]. The formula is given below:

$$ADEQ = (A + 0.5\ C)^{0.9}$$

Where:
ADEQ = adult equivalent units, A = number of adults (above the age of 15 years) C = number of children in a household (below the age of 15 years).

To construct a food security index, there are two steps involved; Identification and Aggregation [22,23]. Identification is the process of defining a minimum level of nutrition necessary to maintain a healthy living and this is known as the "Food Security Line". Any household that falls below this is classified as 'food insecure' and above it as 'food secure'. The average daily calorie requirement for a moderately active adult is 2,850 Kcal/day and a safe minimum daily intake should not fall below 80% of the above calorie requirement, which means that the minimum intake should be about 2,280 kcal per adult equivalent per day [14]. This defines the food security line as used in this study.

Aggregation is the process of deriving the food security statistics for the households. The household daily calorie intake is obtained from the questionnaire and from there the quantity of food consumed by the household is estimated over a 28-day period. The calorie content is estimated using a nutrient composition table of commonly eaten foods in Nigeria. Per capita calorie intake is calculated by dividing the estimated total household calorie intake by the family size after adjusting for adult calorie intake equivalent. The daily per capita calorie intake is then estimated by dividing total household per capita calorie intake by 28. Households with a daily per capita calorie intake of 2,280 kcal and above are regarded as food secure, while those with lesser amount are food insecure.

The food security (Z) index as applied Fakiyesi is given by the formula:

$$Z = \frac{Yn}{R}$$

where Y_n is the nth household's daily per capita calorie intake and R is the recommended per capita daily calorie intake.
Thus, Z_n=1 for $Yn \geq 1$ (i.e. food secure households) and
Z_n= 0 for $Yn \leq 1$(i.e. food insecure households) [24].

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Based on Z, other food security measures can be calculated. They include: shortfall/surplus index (P), the head count ratio (H), and the food insecurity gap [14, 25, 26].

The shortfall/surplus index measures at aggregate level, the extent to which households are above or below the food security line. It is given as:

$$P = \frac{1}{M}\sum_{n=1}^{m} Gn$$

where M is the number of households that are food insecure (or secure), Gn is the per capita calorie intake deficiency (or surplus) of the nth household.

$$Gn = \frac{Yn - R}{R}$$

The head count ratio (H) measures the fraction of the population that is food insecure and it is calculated as; $H = \frac{M}{N}$

where M is the number of food insecure households, and N is the sample population. The Food Insecurity Gap is given as:

$$FIGn = \frac{TCRn - TCCn}{TCRn}$$

where FIG*n* is given as the Food Insecurity Gap of the nth household, TCR*n* is the total calorie requirement for the nth insecure household and TCC*n* is the total calorie consumed by the nth insecure household. Therefore, the total food insecurity gap is given as:

$$TFIG = \sum_{i<n} \frac{\left(\frac{TCRn - TCCn}{TCRn}\right)}{FIH}$$

where, *TFIG* = Total Food Insecurity Gap, which indicates the depth of food insecurity among the food insecure households and n = Number of food insecure households.

The Squared Food Insecurity Gap, which indicates the severity of food insecurity among households is given as:

$$SFIG = \sum \frac{(FIGi)^2}{FIH}$$

where, SFIG = Squared Food Insecurity Gap, which indicates severity of food insecurity among the food insecure households [27].

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Secondly, the binary logistic regression model was used to identify and examine the determinants of food security among the households. The logistic regression was chosen for this study because of the nature of the response variable, which is dichotomous and for the fact that it can estimate the probability of a certain event occurring [28]. It also accommodates a lot of variables (discrete and continuous), which can be ranked in a hierarchy to show which variables strongly affect the response variable and the association between the independent variables.

In this study, the dependent variable Z (current food security status of households) is dichotomous and defined to have two possible outcomes: that the households are food secured (coded 1) with probability π and that the households are not food secured (coded 0) with probability $1 - \pi$. Such a variable is a point binomial variable and the model often used to express the probability π as a function of potential independent variables under investigation is the binary logistic regression model. Therefore, to sort out which explanatory variables are most closely related to the dependent variable, some factors will be considered. Thus, the study is modeled within the suggested framework of Shiferaw and others [29]. The relationship between the dependent and independent variable is given as:

$Z_n = \alpha Xi + \mu_t$

where Zn is the food security status, which takes the values of 1 for food secure and 0 for food insecure households, αi is the estimated coefficient of the respective parameter, and μ_t is the error term. The form of the logistic regression equation can be represented as follows:

$$\phi_i = E\left(\gamma_i = \frac{1}{\chi_i}\right) = \frac{1}{1 + e^{-\left(\beta_i + \sum_i^k \beta_j \chi_i\right)}}$$

$\emptyset_i$ stands for the probability of household (i) being food secure and γ_i is the observed food security statuses of the nth households, χi are the factors determining the food security status for household n and βi stands for parameters to be estimated [29].

RESULTS

Results from the study on socio-economic characteristics as shown on Table 1 reveal that household sizes were in the range of 2 – 12 people with an average of 6. This size is considered modest enough to guarantee food security for the farm family provided all of them contribute in one form or the other in enhancing food production. About 80.5% of the respondents have farm plots with sizes ranging between 0.1 to 1.9 hectares (ha), while only 6.9% have farms of 3.0 ha and above. The results indicate that small-holder farming predominates in the rural farm set up of the study area.

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Out of the entire population of respondents, only 2.9% realize income of more than ₦18,000 (120USD) on monthly basis, others earn less. The mean monthly income is about ₦9,379 (62.53USD). The respondents' monthly expenditure of food revealed that 89.4% spend about ₦12,000 (80USD) on food, with a mean monthly expenditure of about ₦7,063.58 (47.09USD).The low income realized is not unexpected in view of the low farm size and hence a large proportion of the income is needed to satisfy the subsistence needs of the family. These are suggestive of the fact that there is small marketable surplus and farmers are mostly subsistence-oriented.

A probe into the major sources of food consumed by the rural households as shown in Table 2 revealed that majority of them (about 42.7%) purchased a larger proportion of their staple foods directly from the market, while 22.3% obtained only a part of their foods from their home grown production and supplemented same with foods purchased from the market to meet up with their family needs. As evidenced here, low farm productivity is suspected, which might further aggravate to food insecurity among the farming households.

On the basis of data analyzed to inquire about the food security status of the rural households, and as presented in Table 3, majority (about 70%) of the rural farming population under study were food insecure and only thirty one of the 103 respondents were food secure.

The food security status (Z) was calculated and the mean food security index was 0.80 for insecure households and 1.08 for secure households.

Based on Z, other food security measures were calculated. The shortfall index (P_{sf}) was 0.0800 while the surplus index (P_{sp}) was 0.0771. The calculated head count ratio (H) was 0.6990, indicating that 69.90% of households in the study area are food insecure. For secure households, the head count ratio is 0.3009, showing that only 30.1% of households in the study area are food secure. The Food Insecurity Gap (FIGn) measures the depth of food insecurity within households and for all households, the total food insecurity gap (TFIG) was calculated to be 5.7622 and per household 0.080. The calculated Squared Food Insecurity Gap value was 0.4612 indicating that the problem of food insecurity was 46.12% severe in the study area.

The binary logistic regression model used gave results of the parameter estimates of these variables as presented in Table 4. Most of the variables have positive and significant impact on household food security. These variables are farm size, educational status, average monthly income, membership of cooperative society and the use of modern farm inputs. However, the household size and age of the household head have negative and significant impacts on household food security.

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DISCUSSION

The predominance of small farm size holding is probably as a consequence of the traditional land inheritance policy which entitles every member of the farm family to have a portion of the farmland as a birthright. Such custom of land inheritance leads to land fragmentation and wastage of arable lands by absentee farmers. The practice of large scale commercial agriculture may be practically difficult in the study area in view of shortage of arable owned lands.

The model size of farmland being observed to be less than three hectares across board in the study area implies a low level of production and agricultural output in the area. A greater percentage of the farmers cultivate small areas of farmland, in most cases less than one hectare, a farm size considered uneconomical to meet the needs of their subsistence, let alone produce surplus for the market. This means that most of the respondents were unable to produce enough food to feed themselves as a larger percentage of them purchased directly from the market. The need arises, therefore, as to how to increase farm productivity and/or secure alternative sources of additional revenue to meet up with the subsistence needs of farmers. The mean monthly income of about ₦9,379 compared with a mean monthly expenditure on food standing at about ₦7,063.58 is worrisome and portrays danger for the food security and survival of the farming households. The implication of this is that majority of the farmers live from hand to mouth and by spending a greater percentage of their monthly income (about 75.3%) on food for the family, thereby making food a wage good for them.

An index value obtained for the mean food security status of insecure households was 0.08 and 1.08 for secure households. These values, compared with a calculated shortfall index (P_{sf}) of 0.0800 and surplus index (P_{sp}) of 0.0771, imply that the food insecure households fell below the food security line by about 8% and the food secure household exceeded the food security line by 7.7%.

The head count ratio (H) was 0.6990 and indicates that 69.90% of households in the study area are food insecure implying that more than two-thirds of the respondents in the study area are subsisting on less than the recommended daily per capita calorie requirement, while a smaller proportion (less than one-third) are subsisting above this requirement.

The total food insecurity gap (TFIG) per household calculated to be 0.080 implies that the food insecure households are short of the recommended calorie intake by 8%. The calculated Squared Food Insecurity Gap value was 0.4612 indicating that the problem of food insecurity was 46.12% severe in the study area.

The results of the binary logistic regression model revealed that farm size, educational status, average monthly income, membership of cooperative society and the use of modern farm inputs have positive and significant impact on household food security. On the other hand household size and age of the household head have significant negative impacts. This means that the likelihood of a household being food secure

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increases with an increase in farm size, average monthly income, being members of a cooperative society and, making use of modern farm inputs in their agricultural activities.. In contrast, the likelihood of a household being food secure decreases with an increase in household size and age of the household head.

CONCLUSION AND RECOMMENDATIONS

The analysis and findings in this study have shown clearly that food insecurity is a real problem issue within the study area. The study area can thus be classified as food insecure as almost 70% of the population is below the food security line which is 2,280 Kcal per adult equivalent [14]. Three major factors were found to have positive and significant effects on food security; these are farm size, average monthly income and the use of modern farm inputs. Thus, an increase in the size of available farmland and increased use of modern farm inputs could allow for a larger area of land to be cultivated for food production and improve the level of food security. Also, an increase in the average monthly income means that there would be more money to purchase inputs which would allow enhanced production or the purchase of food materials not produced by the household.

In order to reduce the level of food insecurity among rural farming households, the following recommendations are made:

- Enlightenment programmes on health and birth control measures should be introduced to the farming households so as to educate them on the need to adopt modern family planning techniques and limit their family size.
- Empowerment of farming households through provision of adequate access to modern farming input and equipment required for farm expansion.
- Provision of income earning opportunities for the farming households by generating rural employment through the introduction of micro-enterprises.
- Design and implementation of food security and nutrition policies and programmes.
- Investments in productivity-enhancing agricultural research and rural infrastructure, both of which are important in achieving food security.

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Table 1: Socio-economic Characteristics Distribution of Rural Farming Households*

Characteristics	Frequency distribution			
Household size	2-4	5-8	9 and above	
	(21.4)	(65.0)	(13.6)	
Farm Size (ha)	1- 1.9	2- 2.9	3 and above	
	(80.5)	(12.6)	(6.9)	
Average monthly income (₦'000)	3-9	9.01-15	15.01and above	
	(49.5)	(33.0)	(16.5)	
Average monthly expenditure on food (₦'000)	Less than 3	3.01 – 9	9.01- 15	15.01 and above
	(2.9)	(71.9)	(21.4)	(3.9)

*Figures in parentheses are the percentage frequencies

Table 2: Major food sources of households

Major food source	Frequency	Percentage
Labour exchange for food	1	1.0
Market purchase	44	42.7
Own production	35	34.0
Own production and Market purchase	23	22.3
Total	103	100.0

Source: Field Survey, 2011

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Table 3: Food security status of households

Food security Status (Z)	Frequency	Percentage
Insecure	72	69.9
Secure	31	30.1
Total	103	100.0

Table 4: Parameter estimates of the determinants of food security

Variable	Coefficient	Standard error	z-Statistic	Probability
Constant	-3.0588	1.0420	-2.9354	0.0042
Farm size	1.7765	0.81325	2.1844	0.0310
Household size	-0.39548	0.15301	-2.5847	0.0115
Age	-0.10752	0.07468	-1.4796	0.0294
Educational status	0.33826	0.22153	1.5269	0.1305
Average income	0.45849	0.18624	2.4618	0.0168
Cooperative soc.	1.3040	0.58993	2.2104	0.1894
Modern input	0.0058236	0.0033776	1.7242	0.0882

Log likelihood value = 58.041; Pesaran-Timmermann test statistic = 6.4229;

Percentage of correct prediction= 0.822

Number of included observation=101

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