Full Length Research Paper

Determinants of Household Food Security in the Sekyere-Afram Plains District of Ghana

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The study was carried out to assess the determinants of household food security among rural households in Sekyere-Afram Plains District of Ghana. Data were collected from 100 randomly selected households through the use of structured questionnaires. Analytical techniques employed included descriptive statistics to analyze the characteristics of respondent households, and logistic regression model to examine the determinants of food security among the households surveyed. Among the variables considered in the model, household size, farm size, off-farm income, credit access, and marital status were found to significantly influence household food security. Consistent with *apriori* expectation, larger households were found to be food insecure compared with households with smaller sizes, *ceteris paribus*. Also, consistent with findings from previous empirical studies, farm size, off-farm income and credit access were found to have significant positive effect on household food security. The study, therefore, recommended improved access to credit for rural households and diversification of household economic activities to include off-farm income generating businesses to improve food security at the household level.

Keywords: Household Food security, Logistic regression, Ghana.

INTRODUCTION

Food security and insecurity are terms used to describe whether or not households have access to sufficient quality and quantity of food. Food security issues gained prominence in the 1970s and have since been given considerable attention. Food security is perceived at the global, national, household and individual levels. Food security at global level does not guarantee food security at the national level. Moreover, food security at the national level does not guarantee food security at the household or

even the individual level. Ghana's economy until recently had been strongly dominated by the agricultural sector. The agricultural sector is the second largest contributor to the country's GDP after the service sector, yet it is characterized by low productivity and limited competeness. This is because the sector is dominated by subsistence and smallholder production units applying mostly basic and low level technology (Duffour, 2010). It is a source of livelihood for majority of Ghana's population. It is the source of raw materials for industries; a major foreign exchange earner and also the main source of food security for the country. Agriculture is the main employer of rural

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households. It is the small scale farmers who produce for incomes, food and employment.

Notwithstanding the enormous contribution of agriculture to the country, there are problems of food insecurity especially among producers. Food security issues in the country are also affected by both local and international issues. Some local challenges are linked to policies and their implementation, and exclusion of the poor and those affected in decision making. International constraints like policies of donors, trade arrangements, liberalization of the economy, and activities of the extractive industries affect the sector.

In 2000, world leaders committed themselves to the Millennium Development Goals (MDGs) and one aim of the MDGs is to eradicate poverty and hunger. The target is "to reduce by half the proportion of people who suffer from hunger" by 2015.Over 800 million people in the world are food insecure (Gyamfi, 2006). Ghanaians are no exception even though Ghana is endowed with numerous natural and human resources. Ghana's overall performance in terms of agricultural production and productivity remains inadequate and has failed to make progress on the food security front. Ineffective production techniques, low yielding varieties, inadequate supply of water, among others, are part of the constraints to the achievement of household food security (Gyamfi, 2006).

Food insecurity in Ghana is concentrated in the rural areas. Majority of the Ghanaian rural population chronically suffer from mass poverty in more severe situations than the urban dwellers. In 2009, according to the report by Comprehensive Food Security and Vulnerability Analysis (CFSVA), 19% of rural households were food insecure as compared to 10% of urban households. Under-nourishment and malnutrition are common in rural Ghana and very large proportion of peasant farmers live under the absolute poverty line. Moreover, lack of means of production, and large family size (majority of which are dependants) are the main characteristics of Ghanaian peasant farmers at present. This is why the issue of food insecurity has become the concern of many academicians, political leaders and other professionals today.

Majority of the research works that have been done so far on the issues related to food insecurity in Ghana are very general and consider the problem from national or regional points of view. While aggregate data are generally available at the national level, little work has been done to understand the food security problem at the household level in specific locations/districts. Having national food balance data is not sufficient to understand the food security dynamics in the country. Most agricultural production comes from millions of rural households. Despite the increasing global concern of improving food security, the nature and extent of food security at the household level in rural areas is not well documented. Thepurpose of this study was, therefore, to investigate the critical determinants of food security in rural areas in Ghana using Sekyere-Afram plains District as a case study.

The main objectives of the study were to:
- Determine the food security situation among households in the study area, and
- Examine the principal determinants of household food security in the study area.

LITERATURE REVIEW

Most of the world's poorest countries are in Africa and many of these face chronic poverty and food insecurity. Agriculture, of which 85-90 per cent is rain-fed in Sub-Saharan Africa, accounts for 35 percent of the region's gross national product (GNP), 40 percent of exports and 70 percent of employment (World Bank, 2000). Clover (2003), Smith (2007), Babatunde et al.(2007), Swaminathan (2008), Oriola (2009), Fayeye and Ola (2007) are some of the works that have examined food security in developing countries. The authors argue that domestic policies in many developing countries have contributed very marginally to food security especially in Africa, and that, despite the growing global food production, hunger, malnutrition and famine are prevalent in many developing countries. From their analysis it is evident that improvement in food production in Sub-Saharan Africa will boost per capita GDP, raise purchasing power and access to food. Their major conclusion is that research is needed on new technologies that are output-driven, ecologically friendly, acceptable and affordable to the resource-poor farmers. Finally, they argue that good governance and stable political governance system will provide an essential and enabling environment for food security in Sub-Saharan Africa.

According to CFSVA (2009), 5 percent or 1.2 million of the Ghanaian population, of whom the majority reside in rural areas, is food insecure. Ghana has seen the number of people living in poverty reduced significantly; in 2005/2006 the share of the population living in poverty was calculated at 28.5% down from 39.5% in 1998/1999. This makes Ghana one of the few countries that are on track to meet Millennium Development Goal (MDG) before the target year of 2015.

Definitions and Concepts of Food Security

Food security is a concept that has evolved over time. As much literature has spiraled, many definitions and conceptual models on household food security have been presented (Smith et al., 1992). There are approximately 200 definitions and 450 indicators of food security (Hoddinott, 1999). In Africa, food crisis in the early 1970s stimulated a major concern on the part of the international

donor community regarding supply short falls created by production failures due to drought and desert encroachment (Maxwell,1992).In 1983, FAO analysis focused on food access, leading to a definition based on the balance between the demand and supply side of the food security equation: "Ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983).In the World Bank (1986) report, Poverty and Hunger, this concept of food security is further elaborated in terms of: 'access of all people at all times to enough food for an active, healthy life.'

At the 1996 World Food Summit 182 nations agreed and adopted a still more complex definition: 'Food security, at the individual, household, national, regional and global levels. Food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1998). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food. As a result, a synthesis of these definitions, with the main emphasis on availability, access, and utilization, serves as working definition in projects of international organizations.

Food security Components

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

Availability

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

Access

Access emphasizes on having sufficient resources to obtain appropriate foods for a nutritious diet. It is the way different people can obtain the available food. Normally, we access food through a combination of home production, stocks, purchase, barter, gifts, borrowing or food aid. Food access is ensured when communities and households and

all individuals within them have adequate resources, such as money, to obtain appropriate foods for a nutritious diet (Riely et al. 1995). Access depends normally on; income available to the household, the distribution of income within the household, the price of food,and other factors worth mentioning are individuals' access to market, social and institutional entitlement/rights (ibid).

Utilization

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

Stability

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

Determinants of Food security

Factors that affect household food security in various developing countries especially in Africa have been documented in some literature and these factors or determinants are most often than not location-specific (i.e. different study areas were found to have variant attributes as food security determinants with some attributes recurring). The study conducted in Nigeria by Oluwatayo (2008) using probit model found out that sex of household head, educational level, age and income have positive influence on food security whereas household size has negative influence on household food security. Study by Sikwela (2008) in South Africa using logistic regression model showed that per aggregate production, fertilizer application, cattle ownership and access to irrigation have positive effect on household food security whereas farm size and household size have negative effect on household food security.

Babatunde et al.(2007) is another detailed work on food insecurity in Nigeria. The study utilized a three-stage random sampling technique to obtain a sample of 94 farm households and a cross sectional data in year 2005. Using

the recommended calorie required approach; the study revealed that 36 per cent and 64 per cent of the households were food secure and food insecure respectively. The Shortfall/Surplus index showed that the food secure households exceeded the recommended calorie intake by 42 per cent, while the food insecure households fell short of the recommended calorie intake by 38 per cent. A logit regression model estimated showed that household income, household size, educational status of household head and quantity of food obtained from own production were found to determine the food security status of farming households in the study area.

METHODOLOGY

Sampling technique

With the creation of the Sekyere-Afram Plains District from the old Sekyere East District, the District now covers an estimated area of 3,500.59 square kilometers and has 106 communities and settlements of varying sizes. A two stage random sampling technique was employed in this study. Random sampling was used to select four communities and 25households per community. Both primary and secondary data werecollected through personal interviews with the use of structured questionnaires. The questionnaire used covered the personal characteristics of the farmers, land acquisition, credit access, crops grown, livestock number and household assets such as cutlass, hoe, pick axe, building, etc. Also included in the questionnaire was the USDA Household Food Security Scale (Revised in March 2000) which was used to measure the food security status of households.

Analytical model

The binary logit model was used to investigate the determinants of household food security among the rural households surveyed. The USDA Household Food Security Scale(Revised in March 2000) was used to disaggregate the households into food secure and food insecure households. The dependent variable in this case, food security, was a binary variable which took a value of one if a household was found to be food secure, and zero if otherwise.

A variety of models can be used to establish the relationship between the potential determinants and food security. The study employed the logit model in line with earlier researchers. Following Bogale (2009), the cumulative logistic probability model can be econometrically stated as:

$$P_i = F(Z_i) = \frac{1}{1+e^{-(\alpha+\sum \beta_i X_i)}} \quad \dots\dots\dots\dots\dots\dots (1)$$

Where:

P_i = the probability that an individual is being food secure given X_i

X_i = a vector of explanatory variables

α & β = regression parameters to be estimated.

e = the base of the natural logarithm

For ease of interpretation of the coefficients, a logistic model could be written in terms of the odds and log of odd. The odds ratio is the ratio of the probability that a household would be food secure (P_i) to the probability of a household not being food secure (1- P_i). That is:

$$\frac{P_i}{1-P_i} = e^{Z_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Taking the natural logarithm of the equation yields:

$$Ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \alpha+\beta_1 x_1+\beta_2 X_2+\dots+\beta_m X_m \dots\dots\dots (3)$$

If the error term, ε_i is taken into account the equation becomes:

$$Z_i = \alpha + \sum_{i=1}^{m} \beta_i X_i + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

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

X_1 = Age of Household Head (AGE) in years

X_2 = Gender of Household Head (GEND) – Male =1, Female = 0)

X_3 = Marital Status of household Head (MSTAT) – Married =1, Otherwise=0)

X_4 = Household size

X_5 = Education level of Household Head (Number of years of formal education)

X_6 = Farm size (FSZ) in acres

X_7 = Off-farm income activity (If yes =1, otherwise= 0)

X_8 = Credit Access (if yes =1, otherwise= 0)

X_9 = Fertilizer Application (if yes =1, otherwise= 0)

X_{10} = Remittance (GHC)

The parameters of the logistic regression model were estimated using the maximum likelihood approach.

RESULTS AND DISCUSSION

Respondent's socio-economic characteristics

Respondents' socio-economic characteristics are presented in Table 1. Male household headsconstituted majority (61%) of the sampled people.The modal age was between 40 and 50 years, indicating thata typical farmer interviewed was economically active.There were more married household heads(74%) than those divorced(12%),widowed(9%) and single(5%).As high as 86% of households surveyed had more than four (4) members implying that the average household in the study area had a large size.Meanwhile, distribution of household

Table 1. Household Distribution by socio-economic characteristics

Household Characteristics	Frequency	Percentage
Gender		
Male	61	61
Female	39	39
Age		
<20	2	2
21-30	11	11
31-40	20	20
41-50	31	31
51-60	27	27
61-70	7	7
>70	2	2
Marital status		
Single	5	5
Married	74	74
Divorced	12	12
Widowed	9	9
Household size		
1-3	14	14
4-6	41	41
7-9	35	35
10-12	9	9
>12	1	1
Education level		
None	18	18
Primary	26	26
JHS/Middle school	42	42
SHS/O'Level/A'Level	9	9
Tertiary	5	5
Off-farm income		
Yes	62	62
No	38	38

Source: Field survey, 2011.

heads by education revealed that majority of them had a junior high school education(42%). About 62% of household heads interviewed were engaged in off-farm income-generating activities.

Food security status of Households

As depicted in Table 2, majority of the households surveyed (79%) were found to be food insecure and only 21% were food secure.

Determinants of Food Security

Table 3 below provides the parameter estimates for the logit model. From the maximum likelihood estimates of the model, the Pseudo R^2 was 0.67 which implies that about 67% of the likelihood of a household being food secure is strongly explained by the independent variables. The marginal effects of the independent variables were estimated because they are very important for policy and decision making.

Among the 10 variables considered in the model, five were found to have significant impact on household food security. They included marital status, household size, farm size, off-farm income activity and credit access. With the exception of marital status, all the explanatory variables had the expected signs.

Marital status was significant at 10% and the coefficient indicated that households headed by unmarried people are more likely to be food secure than those headed by

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Table 2. Food security status of the households

Food security status	Frequency	Percentage
Food secure	21	21.00
Food insecure	79	79.00
Total	**100**	**100.00**

Source: Field Survey, 2011.

Table 3. Parameter estimates of determinants of household food security

Variable	Coefficients	Odds ratio	z-values	p-values
Constant	1.871572			
Age	-0.079428	0.9236445	-1.61	0.107
Gender	-0.149916	0.8607803	-0.13	0.897
Marital status	-2.900491	0.0549962	-1.74*	0.082
Household size	-1.387542	0.2496882	-2.84***	0.004
Education	0.5689745	1.766455	0.95	0.340
Farm size	0.9084391	2.480448	1.86*	0.063
Off farm	3.979105	53.46917	2.58**	0.010
Credit access	2.258334	9.56714	1.82*	0.068
Fertilizer	2.109547	8.244506	1.46	0.145
Remittance	-1.463556	0.231412	-0.96	0.339

Pseudo R^2 = 0.6747
Log Likelihood function = -16.7147414
Observations = 100

*, **, *** Significant at 10%, 5% and 1% respectively

married people. This finding was contrary to findings by Haliuet al. (2007) in Ethiopia and Kaloi et al.(2005)in Uganda, it is quite reasonable. The odds ratio in favour of food security decreases by the factor 0.0549962, and it may be due to the fact that households with married people as heads may have larger household sizes and thus many mouths to feed.

Household size had a negative and significant relationship with food security at the 1% significant level, implying that the probability of food security decreases with increase in household size. The odds ratio in favour of food security decreases by the factor 0.2496882 as the household size is increased by one member. An increase means more people to feed and indirectly reduces income per head, expenditure per head and per capita food consumption. The likely explanation is that in an area where households depend on less productive agricultural land, increasing household size results in increased demand for food. This demand, however, cannot be matched with the existing food supply from own production and this ultimately end up with the household becoming food insecure. This outcome is consistent with the outcome of a study conducted by Sikwela (2008) in Zimbabwe.

Farm size was positively and significantly related to the probability of a household being food secure. Farm size is significant at 10%.The odds ratio in favour of food security increases by the factor 2.480448 when the area under cultivation is increased by one acre. According to Van Der Veen (2010), food production can be increased extensively through expansion of areas under cultivation. With large farm size households can produce more and also diversify. This outcome is consistent with the finding from a research conducted by Bogale (2009) in Ethiopia. it is however contradictory to the finding by Sikwela (2008) who found farm size to be negatively related to food security in Zimbabwe.

The coefficient of off farm income was positive indicating that there is a positive relationship between off farm work and food security. Off farm work is significant at 5%. Households diversify their incomes by working as daily labourers, petty traders, artisans, and by working as daily construction labourers. Off-farm income generating

activities have a paramount significance to diversify the sources of farm households' livelihoods. It enables farmers to modernize their production by giving them opportunity to reduce the risks of food shortage during periods of unexpected crop failures. Income from these off-farm activities is also invested in agriculture to increase production and food availability at the household level.

Credit access was found to be significant and positively related to food security in the study area. Farmers' access to credit will increase the food security status of his household by the factor 9.56714.This may be due to the fact that households which have the opportunity to receive credit would build their capacity to produce more through the use of improved seeds and the adoption of improved technologies. This finding is also consistent with the findings of Bogale (2009) in his study in Ethiopia.

The coefficients of age, gender, education, fertilizer and remittances were not significant in explaining the food security status of households in the study area at the 10% level.

CONCLUSION AND RECOMMENDATIONS

The study has shown that majority (79%) of households in the Sekyere-Afram Plains District were food insecure during the period of the survey. Consistent with *a priori* expectation and findings from previous studies, farm size, off-farm income activity and credit access were found to significantly influence household food security in the study area positively. However, household size was found to influence food security negatively at the household level. Also, households headed by married people were found to have a higher probability of becoming food insecure compared to their counterparts headed by unmarried people. Contrary to *a priori* expectation, educational level of the household head was found to be statistically insignificant in explaining the food security situation at the household level.

In the light of the findings from the study, it is recommended that efforts to improve access to credit by farmers and the promotion of off-farm activities as alternative livelihood options should be pursued by both local and central government structures in Ghana to improve the household food security situation in rural Districts. Policies that will make micro-credit from government and non-governmental agencies accessible to rural farmers will go a long way in addressing their resource acquisition constraints and eventually improving household food security in the country.

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