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COMPARATIVE ANALYSIS OF FOOD SECURITY STATUS OF FARMING HOUSEHOLDS IN THE COASTAL AND THE FOREST COMMUNITIES OF CENTRAL REGION OF GHANA

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ABSTRACT

The study examines the food security status of farming households in the Coastal and forest belts of the Central region of Ghana. A multistage sampling technique was used to select the households that were interviewed using a structured questionnaire. In all, data obtained 260 households were used for the analysis (120 and 140 households from the forest and Coastal communities, respectively). The study revealed that majority of the households (67.9%) was food insecure. In this respect, farming households in the forest areas were less food insecure compared to their counterpart in the coastal areas. Thus, food insecure farming households in the coastal areas consume far lower (34%) than their recommended daily calorie intake than food insecure households in the forest areas (26%). Food crop farmers are the most affected in terms of food insecurity compared to the other groups of farmers (Tree crops and Vegetable farmers). The food security status of the farming households across both coastal and forest communities are influenced by dependency ratio, and quantity of own farm production. Furthermore, access to credit, and total annual income improved food security status of farming households in the forest communities but not relevant to coastal communities. Higher education improves food security status of farming households in the coastal communities but not significant among farming households in the forest communities. These results have policy implications for improving food security situation in developing countries.

Key Words: Food Security, Farming Households, Forest Communities, Coastal Communities.
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INTRODUCTION

The population of undernourished people has increased by 18% from 1995/97 to 2008/09 (International Institute for Environment and Development (IIED, 2010), despite the improvement in technology of farming and food preservation and storage. These developments coupled with the increased in number of poor has worsened food security situation in the world. About half (44%) of the population of Africans live on less than US$ 1.25 per day in 2010 (African Development Bank, 2011). The increasing number of food insecure people has attracted attention worldwide and no part of the world is immune (FAO, 2009). The number of people suffering from chronic hunger has hit 1.2billion in 2009 (FAO, 2009). The challenge confronting the world today is how to secure food for these hungry people and also double food production to meet food demand of world population which is projected to reach 9.2 billion by 2050 (FAO, 2009). Almost all developing countries were predicted to suffer from a decline in energy intake between 2005 and 2010 (Brinkman et al. 2010). This has the tendency of causing an additional 450 million people to become hungry, due to high food prices and poor growth in GDP per capita (Brinkman et al. 2010). The assumption held by many is that higher food prices benefit farmers (Holmes et al. 2009). Ironically, only few of these farmers, usually less than 20% produce enough surpluses to be considered as net sellers (Barrett, 2008; WFP, 2009). Farmers often sell their produce at low prices at harvest time and end up purchasing food at a high price during the lean season due to pressing need for cash, lack of storage capacity, and lack of financial assistance (Brinkman et al. 2010).

Ghana has made significant gains in the fight against poverty by reducing the poverty level from approximately 51.7% in 1991-1992, to 28.5% in 2005-2006 (Ghana Statistical Service (GSS), 2008). However, the depth of poverty has exacerbated and spread into urban areas (World Food Program (WFP), 2009). Agriculture sector employs more than half (55.8%) of Ghanaian population, however, large percentage of this proportion of the population remains stuck below the poverty line (GSS, 2008). This is evident in the findings of World Food Program (2009), which recognized farming households as the most affected by poverty among all the economic activities with almost half of them (46%) falling below the poverty line. According to Ghana Statistical Services (2008), about 18.2% of Ghanaians out of 28.5% that are considered poor fall below the extreme poverty line and are chronically food insecurity. The remaining 10.3% though above the extreme poverty line but classified as poor are vulnerable to food insecurity depending on the weather conditions (GSS, 2008). Similarly; Jayne et al. (2005) reported that broad-based agriculture-led poverty reduction is strongly linked with equitable access to Land. This implies that access to land plays a crucial role to reducing rural poverty and ensuring food security. Hence, securing access to land for the rural poor provides an incentive for sustainable management, as recorded in many local studies in China, (Guo et al. 1998); Kenya, (Ogada et al. 2010); Ghana and Rwanda, (Migot-Adholla et al. 1993). Nevertheless, land tenure system in Ghana has been a major setback in introducing land improvement programs to increase farmer's productivity to ensuring food security among farming households.

Lands in Ghana are regarded as clan or family property and are shared among family members at the demise of family head or household head. As family size keeps on expanding, the land available to each family member keeps decreasing forcing farming households to enter into share cropping agreement. Share cropping takes different forms stemming from dividing the entire farm produce into two between the farmer and land owner in which case the land owner support the farmer with some resources, to dividing the farm produce into three where two-thirds go to the farmer and the remaining to landowner. Though governments over the years have introduced various policies aimed at ensuring food security, some empirical studies claimed that food security policies have failed to address the core livelihood risk issues of inadequate nutrition, malnutrition and poverty in developing countries (Pretty and Koohafkan, 2002; Ruivenkamp, 2005; Windfuhr, 2005). The reasons for the failure of the policies are that, food security policies rather forced markets open to dumping of agricultural produce, privatization of communal and public natural resources and concentration of resources in the hands of the rich minority. Available statistics indicate that economy of Ghana is doing well at the macro level making Ghana to be regarded as one of the fastest growing economy in the world (GSS, 2012). However, much cannot be said about the micro level since perception across majority of Ghanaians is that, the growth of the economy is not felt by the populace. Equally worth noting is the recent happenings in the world in terms of high food prices, changing climatic patterns and growing demand for land for biofuel cultivation in Ghana which has made it necessary to investigate the current food security status of farming households who are already trapped in poverty. The Central region is the fifth poorest region in Ghana and also where vast arable land is used for biofuel (jatropha) cultivation. These developments coupled with the recent high food prices have serious implications on the food security status of the region making it one of the vulnerable regions to food insecurity in Ghana. However, most of food security studies conducted in Ghana were concentrated in the three northern regions considered the poorest. The few studies conducted on the Central region examine the effects of biofuel cultivation on household food security. Much has not been done in analyzing the food security status of farming households who are the most food insecure population.

Therefore, the objectives of the study are threefold: First, to establish the food security status of farming households in the forest and coastal communities in the Central region of Ghana; second, to compare the food security indices of farming households in the Coast communities to farming households in the forest communities; third, to determine factors influencing food security status of farming households, and to compare the effects of these factors across forest and the coastal communities.

LITERATURE REVIEW

The term “food security” has attracted attention worldwide after the world food conference in 1974. Several organizations and individuals have defined food security differently but notable among them was the one provided by World Bank, (1986). Food security is defined as “access by all

people at all times to enough food for an active and healthy life" (World Bank, 1986). This definition provides a standard for further definitions and addresses the issues of availability, accessibility, as well as utilization of food for healthy living. The World Bank's (1986) definition was subsequently elaborated by FAO to include the nutritional value and food preferences. FAO, (1996) defined food security as a situation 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 a healthy and active life.

The inclusion of "safe and nutritious" stresses food safety and nutritional composition whiles the addition of food preferences changes the concept of food security from mere access to enough food, to access to the food preferred. However, the operational definition for food security by Ministry of Food and Agriculture in Ghana is "good quality nutritious food hygienically packaged, attractively presented, available in sufficient quantities all year round and located at the right place at affordable prices" (Ministry of Food and Agriculture (MoFA, 2007). When an individual or population lacks, or is potentially vulnerable due to the absence of, one or more factors outlined in the above definition, then the individual/population is said to be food insecure. The inclusion of stability of food supply and food and nutrition safety in the definition of food security (USAID, 2008) has added additional dimensions to food security. Jrad et al. (2010) elaborated on five dimensions of food security as food availability, food accessibility, food utilization, stability of food supply and food and nutrition safety. Aside natural disasters that can alter the food security status of households and usually make households vulnerable to food insecurity, socio-economic characteristics of households can also influence the food security status of a household. Since human beings have less control over natural occurrences, focusing on socio-economics characteristics of households will provide better alternative in addressing food security challenges. Oni et al. (2011) recognized poverty and food insecurity as interlink situations that cannot be separated. Consequently, it is very difficult to address food insecurity without addressing the most single factor responsible for food insecurity.

Recent studies on food security have focused on socio-economics characteristics of households to draw various conclusions. Some key variables considered in this area of analysis including household size and composition, educational level, landholding size, livestock quantity, quantity of agricultural goods produced, and access to services (Datt et al. 2000; Geda et al. 2001). Others considered sex of household head (Okojie, 2002) in their analysis. In addition, some researchers addressed the relationship between poverty and migration, and remittances (Adams and Page, 2005). Further, some studies included geographical location as variable influencing level of poverty among households (Esanov, 2006).

Ghana has been fairly stable in terms of food security on national basis, although, some food insecurity situations have been recorded in some areas particularly in the three Northern regions. Africa has witnessed severe droughts in the past four decades when about 30 countries were

affected. However, the 1983 and 1984 droughts were the most severe causing wide spread famine in Africa requiring massive humanitarian food aid (Haile, 2005). Ghana was hardly affected by the 1983 drought where acute food shortage was recorded and this saw people depending on all kinds of foods for survival. Among the food consume during this period of drought includes cocoyam comb, bamboo comb, water leafs, and unripe bananas which were substituted for plantain which under normal circumstances were not part of Ghanaian food staff. The available information suggests that the prevalence rate of malnutrition among children below the age of five, and women of reproductive age is still high. It states that 22% of children are stunted or too short for their age, 7% of children are too thin for their height (WFP, 2009; FAO, 2011).

The Government of Ghana, through the Ministry of Agriculture is embarking on various interventions to revert the situation. Notable among the interventions are fertilizer subsidy which allow farmers to access fertilizer at reduced prices and also provision of livestock to selected farmers to serve as out growers. The farmers then returned the offspring of the livestock collected to be given to other farmers in order to expand the scheme. Though the interventions are commendable, they are faced with several challenges. For instance, the fertilizer subsidy comes too late; sometimes several months after farmers have planted their crops, hence the applications of these fertilizers are less effective on the crops. Further, the selection of committed farmers has been a major setback to the livestock improvement program. In most cases farmers selected are perceived to be aligned to particular political parties leading to over politicization of the selection processes. This results in distribution of the livestock to political allies rather than committed and experienced farmers. This has made the program less effective and not visible to many.

METHODOLOGY

General background to the methodology

Several methods have been used by researchers to establish food security status of households, but notable among them are Cost-of-calorie approach and Food Security index approach. Oluyole et al. (2009) examined the food security status among cocoa farming households of Ondo State, Nigeria and employed Cost-of Calorie (COC) function proposed by Greer and Thorbecke, (1986). This method was also used in similar studies (Ojogho, 2010; Adenegan and Adewusi, 2007). The function is stated as:

$$\ln X = a + bC \qquad (1)$$

Where X denotes food expenditure; C denotes calorie consumption (Kcal). From the COC function, the cost of minimum recommended energy level is Z calculated as; $Z = e^{(a+bL)}$

where L denotes recommended daily energy level (Kcal); a is the intercept term; b = coefficient of the calorie consumption. Based on the estimation, a household whose average cost of daily calorie

consumption equal to or more than Z is said to be food secure while a household with average cost of daily calorie consumption lower than Z is considered food insecure. The surplus/shortfall was estimated using the function:

$$P = \frac{1}{N}\sum_{j=1}^{m} G_j \quad (2)$$

G_j is expressed as: $(K_i - L)/L$ and where P denotes surplus/shortfall, L denotes recommended daily per capita requirement (2, 450Kcal); G_j denotes calorie faced by household, X_i denotes per capita food consumption available to household and *N* denotes number of households that are food secure (for surplus index) or food insecure (for shortfall index).

Babatunde et al. (2007) and Omotesho et al. (2010) examined the socio-economic characteristic of household in Kwara State, Nigeria, using food security index to determine the food security status of each household based on the recommended daily calorie approach. This method (i.e. the use of food security index) was also used by several researchers (Arene and Anyaeji, 2010). Household whose food security index is greater or equal to the recommended daily calorie intake were regarded as food secure and those whose food security index is lower than the recommended daily calorie intake (2, 260Kcal) were considered food insecure. The method is outlined in details latter on in this section.Literature has also provided various models for determining factors influencing food security status of households and key among them as used by researchers are Tobit model (Etim and Solomon, 2010), Probit model (Oluyole et al. 2009) and Logit model as used by Babatunde et al. (2007). However, the study used Logit model due to its simplicity in the interpretations of the coefficients. The dependent variable in this case, food security status, is a binary variable which takes a value of one (1) for food secured household and zero (0) for food insecure household. The cumulative logistic probability model was specified by Pindyck and Rubinfeld, (1981) as:

$$P_i = F(Z_i) = 1 + \frac{1}{1 + e^{-(\alpha + \sum \beta_i x_i)}} \quad (3)$$

Where P_i is the probability that an individual is being food secure given X_i (the explanatory variables); α and β_i are parameters to be estimated. The log odds of the probability that an individual is being food secure is given by:

$$\log(\frac{p_i}{1-p_i}) = Z_i = \alpha + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k \quad (4)$$

Numerous methods for testing ranking of an object have been identified from literature and notable among them are Garrett's ranking score techniques, Friedman's two-way analysis of variance and Kendall's coefficient of concordance. There is close relation between Friedman's test and Kendall's coefficient of concordance (Legendre, 2005). They address hypotheses concerning the same data and use Chi squarer test for testing. However, they differ in the formulation of their respective hypothesis. Whereas Friedman's test focuses on the items being ranked, the hypothesis of Kendall's test focuses on the rankers themselves.Garrett's ranking score techniques on the other hand uses average score of the rankers and arrange them in either ascending or descending order. However, the limitation of this method is that it involves a number of steps and it does not test the level of agreements between rankers. Kendall's coefficient of concordance was employed by this study because the Kendall's (*W*) provides the test of agreement of the rankers (respondents), among their rankings which the Friedman's and Garrett's test lack.

Estimating Food Security Index

To establish food security status of farming households in the study area, the study constructed food security index (Z_i) and determined the food security status of each household based on the food security line using the recommended daily calorie required approach as used by Babatunde et al. (2007). Households whose daily calorie intake were equal or higher than recommended daily calorie required were considered food secure households and those whose daily calorie intake were below the recommended daily calorie required were considered food insecure households. The food security index is given as:

$$Z_i = \frac{Y_i}{R} \quad (5)$$

where Z_i represents food security index of ith household, Y_i is actual daily calorie intake of ith households and *R* is the recommended daily calorie requirement of ith household. To obtain per capita daily calorie intake; daily calorie intake of each household was divided by its' household size. Households' per capita daily calorie requirement was also obtained by dividing the households' daily calorie requirement by household size. Based on the food security index estimated, the study further estimated other indices such as food insecurity gap (FIG), headcount ratio (HCR) and surplus index (SI). Food insecurity gap is given by:

$$\frac{1}{M}\sum_{i=1}^{n} G_i \quad (6)$$

where M represents the number of food insecure households and G_i is the calorie intake deficiency for the i^{th} households. G_i was further expanded in a form;

$$G_i = (\frac{Y_i - R}{R}) \quad (7)$$

where Y and R are as defined previously (above). The headcount ratio (HCR) is given as:

$$\frac{M}{N} * 100\% \quad (8)$$

where$N$ represents the number of households in the sample.The urplus index (SI) is given by:

$$\frac{1}{M}\sum_{I=1}^{n}(\frac{R - Y_i}{R}) \quad (9)$$

To determine the daily recommended calorie requirement or food needs of each farming household, the Ghana statistical service (GSS) and the international food policy research institute (IFPRI) (2000) standard of 2,900 Kcal was used.The households' composition or daily food requirement (daily calorie requirement) was estimated by first of all categorizing members of each household into different age groups based on the fact that different age groups have different calorie requirements. The daily energy (calorie) requirements of various compositions of the households were converted into adult equivalent using the equivalent scales as shown in Table-1.

Table-1: Recommended Daily Energy Intake and Equivalent Scale

Age Category (years)	Average energy allowance per day	Equivalent Scale
Children (<6)	1150	0.4
Children (6 -18)	2250	0.7
Adults (> 18)	2900	1.0

Source: Ghana Statistical Service, (2000)

Total household composition or calorie requirement was obtained by multiplying the total number of adult in each households by the recommended calorie requirement of 2,900 Kcal (i.e. total number of adult*2900 Kcal). The total food requirements for children were converted to adult equivalent. This was done by multiplying the total number of children below the age of six (6) years in each household by recommended daily calorie requirement of 2900 Kcal and conversion factor of 0.4. The total number of children between the ages of 6 to 18 years in each household was

also multiplied by recommended daily calorie requirement of 2,900 Kcal and a conversion factor of 0.7 to obtain their adult equivalent. The total daily calorie requirement for each household was obtained by summing up the requirement for the three age groups estimated above. Households' daily food consumption (Daily Calorie Intake) was obtained from household own food production and purchases to supplement own food production. The data on actual food consumed (maize, rice, cassava, and plantain) by each household per week was obtained and converted into kilogram. The energy content of 1kg of each foodstuff (maize, cassava, rice and plantain) was obtained from literature as showed in Table-2.

Table-2: Cereal Equivalent Conversion Ratios

Food Crop	Calorie/kg	Milling ratio	Maize equivalent ratio
Maize	3,590	0.85	1.00
Rice	3,640	0.65	0.92
Cassava	1,490		0.40
Plantain	1,350		

Source: Nutrition and Food Science Department, University of Ghana, Legon

The total quantity of each food (in kilogram) consumed was then multiplied by the energy content (e.g. total kilogram of cassava consumed per week *1,490 Kcal = total Kcal of cassava consumed). This procedure was repeated for rice and plantain. However, due to processing and grinding losses, the quantity of maize consumed per week was multiplied by the energy content (3950 Kcal) and the milling ratio of 0.85. The total kilocalories of maize, cassava, rice and plantain consumed by each household were summed up and divided by 7 to obtain actual daily calorie intake.

Sample Size and Sampling Techniques

A multistage sampling technique was used to select the respondents that were interviewed in three stages. The first stage involves the selection of districts and municipalities from which respondents interviewed were selected. This was done using purposive sampling techniques where the districts and municipalities were grouped into forest and coastal areas. It was followed by writing the names of all the districts and municipalities in the forest areas on pieces of paper and randomly picking two districts or municipalities. The second stage involved selection of communities and villages visited using purposive and simple random sampling. This was achieved with the help of the districts' MoFA directorates which grouped the communities into those which have functional Farmer Based Organization (FBO), extension contacts and those who do not have to give fair representation of different groups of farmers. Two communities each were selected from communities with functional FBO and extension contacts and those communities without FBO and extension contacts. The third and final stage was the selection of the farming households that were interviewed. Again, the respondents were selected using simple random sampling. In this respect, data regarding their socio-economic characteristics, food availability, food accessibility, and access to credit were obtained for analysis. In all 260 households were interviewed for the study (i.e. 134

farming households in the forest communities were interviewed but 120 were selected for analysis after removing the questionnaires which were not properly administered and 140 farming households in the Coastal communities). It is important to note that of the 260 households that were interviewed, data was obtained from 1690 individuals for the analysis of the food security status of the households. These 1690 individuals consist of 851 and 839 individuals from the Coastal and forest communities, respectively. The households were selected from two districts and eight communities in the forest belt, and the same was done for the Coastal belt. The eight selected communities in the forest belt are Assin Dompem, Assin Joaso, Ayittey Nkrafoum, Assin Kushea, all in the Assin North Municipality; and AgonaNsaba, AgonaMensakrom, AgonaKwanyako, AgonaAsafo, all in the Agona East Municipality. Similarly, the eight selected communities in the Coastal belt are Senya Bereku, Ahyentia, Aberful, Amadua, all in the Ewutu Senya District; and Munford, Apam, Gomoa Wasa, Gomoa Edwumako, all in the Gomoa West district.

Determining Factors Influencing Food Security Status of Farming Households

Logit regression model was used to determine factors influencing food security status of farming households in the forest and coastal belts of Central region of Ghana and the variables included in the model are described as in Table-3 below and the discussions that follow thereafter.

Table-3: Explanatory variables used in the Logit Model Regression to determine factor influencing Food Security Status of the Farming Households

Variable	Descriptions	Measurement	A priori Expectation
Agehh	Age of household head	Years	+ / -
Genderhh	Gender of household head	Yes= 1, No = 0	+
Farmsize	Farm size	Hectares	+
off-farm	Engagement of off-farm activities	Yes = 1, No = 0	+ / -
Annincom	Annual income	GHS	+
edu_Lev	Level of Education	Primary = 1 JSS = 2 SSCE/WASSE=3 Tertiary = 4	+
aces2crdit	Access to credit	Yes = 1, No = 0	+
lnownership	Land ownership	Yes = 1, N0 = 0	+
Ownprod	Quantity Own production	Kg	+
Dep	Dependency ratio	Ratio	-
Agesquared	Age Squared	Numbers	+/-

JUSTIFICATION OF VARIABLES

Age of household head: The age of household head is expected to impact on his or her labour supply for food production (Babatunde et al. 2007). Young and energetic household heads are expected to cultivate larger farms compared to the older and weaker household head. It also determines the ability to seek and obtain off-farm jobs and income which younger household heads

can do better. Arene and Anyaeji, (2010) found older household heads to be more food secure than the younger household heads. Hence the expected effects of age of household head on food security could either be positive or negative.

Gender of Household Head: Gender of household head looks at the role played by the individuals in providing households' needs including acquisition of food. Household head can therefore be male or female. Therefore, gender of household head was coded as: 1 for males and 0 for females. Female headed households have higher dependency ratios which hinders household capacity to allocate labour to on-farm or other income-generating activities. Also female headed household tend to be older and have fewer years of education than male heads of household (FAO, 2012). The expected effect of this variable is positive.

Farm Size: Farm size is the total area of land cultivated to food and cash crop by households, measured in hectares. Positive relationship has been established between farm size and improvement in households' income and food security (Jayne et al. 2005; Deininger, 2003). The larger the farm size of the household, the higher the expected level of food production. It is, therefore, expected of a household with a larger farm size to be more food secure than a household with a smaller farm size, all things being equal. Hence the expected effect on food security is positive.

Engagement in off-Farm Activity: Off-farm activity is an additional work engaged in by household aside farming to supplement household income. Level of off-farm activity can influence households' food security but this can either be positive or negative depending on the level and gains from the activity (Babatunde et al. 2007). This is because engagement in an activity can bring in money thereby corroborating the food security situation of the household. On the other hand, if farmers spend more of their time on off-farm activities at the expense of working on their farm and particularly if the wage they earn does not commensurate with the forgone farm income, their food security situation could be worsened. Therefore, the expected effect on food security could be positive or negative.

Total Annual Income of Household: This refers to the sum of earnings of household from both off-farm and on-farm sources (Babatunde et al. 2007). Arene and Anyaeji, (2010) noted that the more household head engages in gainful employment, the higher he/she earns income and the greater the chances of being food secure. The income is expected to increase household's food production and access to more quantity and quality food. The expected effect on food security is, therefore, positive.

Level of Educational of Household Head: Education is a social capital which is expected to have positive influence on household food security. According to Shaikh (2007), the educated individuals have capacity to process and apply the information passed on to them. Lower

educational levels impede access to better job opportunities in the labour market, and impede more profitable entrepreneurship (FAO, 2012). An increase in female education not only increase their returns but also has the potential of reducing the fertility level of women, improve their productivity as well as contribute positively to the national growth (Herze et al. 1991).The expected effect of this variable on food security is positive.

Access to Credit: This is the ability of household to obtain credit both in cash and kind for either consumption or to support production. Consumption credit increases household's income on the short term basis and could increase the consumption basket of households (Babantunde et al. 2007). Production credit, on the other hand, when obtained on time could increase chances of household to acquire productive resources (seeds, fertilizers, pesticides and others) which will boost production and improve food situation in the household. Access to credit is therefore dummied as one (1) for households that obtained credit in the last year cropping season and 0 otherwise. The expected effect of access to credit on food security is positive.

Land Ownership: A farmer can own land either through inheritance or outright purchase. Jayne at al. (2005) noted that access to land is key strategy to reduce rural poverty and ensure food security. Evidence available showed that incident of food insecurity and poverty tends to be more severe in landless rural poor (Kyaw, 2009). Land Ownership is therefore dummied as one (1) for households that obtained credit in the last year cropping season and 0 otherwise. The expected effect of access to credit on food security is positive.

Quantity Own farm Production: This is the total quantity of food and cash crop produced by households from their own farm (measured in kilogram). Cash crops are included based on the fact that they can be sold and money realized from their sale could be used to purchase food for household consumption (Babaunde et al. 2007). The quantity of household own production increases the probability of food security (Quinoo, 2010; 2009; Pappoe, 2011). Therefore, the expected effect of this variable on food security is positive.

Farming Experience: This refers to the number of years household head has engaged in farming. All things being equal, an experienced household head is expected to have more insight and ability to diversify his or her production to minimize risk of food shortage. An experienced farmer is also expected to have adequate knowledge in pest and disease management as well as good knowledge of weather. Research findings revealed a positive relationship between farming experience and food security status (Feleke et al. 2003, Oluyole et al. 2009). The expected effect of this variable on food security is, therefore, positive.

Dependency Ratio: This was measured as total household size divided by the number of individuals working to support the household. Owing to the scarcity of resources, an increase in household size especially the non-working members put pressure on consumption than production

(Feleke et al. 2003). Thus, an increase in the number of non-working member of household or dependency ratio increases the food insecurity level of household (Ojogbo, 2010). The expected effect of this variable on food security is negative.

Age Squared: This was obtained by multiplying the age of household head by itself. The inclusion of this variable is as result of nonlinear relationship between age and food security. An increase in age is linked food security but at decreasing rate. Also as age increases, other factors such as farm experience may influence the food security status of households. Negative correlation between age squared and food security was revealed in the findings of Adenegan and Adewusi, (2007).The positive effect of age and a negative effect of age squared imply as people get older the effect of age decreases. A positive effect of age and a positive effect of age squared means that as people get older the effect of age is stronger. Therefore, expected effected of age is either positive or negative.

EMPIRICAL RESULTS

Demographic Characteristics of Households

Age Distribution of Household Heads: The age of farming household heads in the study area ranged from 23 to 86 years with a mean age of 50.6. Majority of the respondents (53.4%) ranged between the ages of 50 to 83 years. The category of household heads that fall into this age range (50 to 83 years) cannot be classified as active group, hence, cannot be relied on for meaningful long time agricultural improvement programs. The most active group of the population (i.e. the youth with age range of 20 – 29 years) formed only 17.5% of the respondents.

Gender Distribution of Household Heads

The data indicate that majority of farming households were male headed households (81.2%) with female constituting only 18.8% of the respondents. According to Babatunde et al. (2007), male headed households are more food secure due to their ability to secure job and hence income, compared to female headed households.

Marital Status of Respondents: The data indicates that majority of the respondents (76.7%) were married, and 20.4% were not married. The population of unmarried households consists of widowed (13.3%) and separated/divorced (7.1%).This implies that majority of the children in the study area have compliments of both parents which may positively influence their food security status.

Educational level of respondents: Analysis of the educational level of household heads revealed that 32.5% of the respondents had no formal education, 12.5% had primary education, whilst 55% had completed at least JSS or Middle school. This implies that majority of the household heads can read and write and can access information on good farming practices from agricultural magazines and bulletins. The finding does not deviate much from the national statistics, where about 31 percent of all adults have never been to school, 7.1% attended school but did not obtain any

qualifications; 39 percent had either middle school living certificate (MSLC) or basic education certificate education (BECE) or vocational education certificate (VOC) as their highest qualification, while only 13.6 % possess secondary or higher qualification (GSS, 2008).

Food Security Status of Farming Households

Table-4 presents the food security status of respondents using recommended daily calorie intake of 2,900 Kcal. The result indicates that majority of respondents (67.9 %) were food insecure and only 32.1% were food secure. This implies that the study area was potentially food insecure. The statistics of the food security status of the farming households showed that the mean food security index for those households who were found to be food secure was 1.4 (i.e. above the threshold of 1). The mean food security index for food insecure households was also found to be 0.67(i.e. below the threshold of 1). Per capita calorie intake was estimated and found to be 2121 Kcal which was below the national average of 2,849 Kcal (www.faoghana.org). These indices were higher compared to what was estimated by Pappoe, (2011) and Quinoo, (2010) in their study conducted in parts of Central region of Ghana. However; Pappoe, (2011) used three food items (maize, rice and cassava) in his analysis and also considered only farming households in the coastal communities.

Table-4: Food Security Status of Respondents

	GSS/IFPRI 100% (2900kcal)	
Item Description	Food Secure	Food Insecure
Percentage of Household	32.1	67.9
Number of Household	77	163
Mean (FSI)	1.4	0.67
Std deviation	0.372	0.174
Per capita Daily Calorie Allowable		2121 Kcal

Source: Field Survey, 2012

FOOD SECURITY INDICES OF FARMING HOUSEHOLDS IN THE FOREST AND COASTAL AREAS

Food security indices of farming households in both the forest and coastal areas were estimated and differences of means were tested using the T-test. The indices tested include Head-count ratio (HCR), food insecurity gap (FIG), square food insecurity gap (SFIG) and surplus index (SI). Head-count ratio measures the proportion of households which were food insecure and the result showed that majority (76%) of the respondents in the coastal areas were food insecure as against 60% identified as food insecure in the forest communities using the recommend daily calorie intake of 2, 900 Kcal (Table-5).

Table-5: Comparing Food Security Indices of Coastal and Forest Farming Households

Indices	Means		t-statistic	d.f	Sig (2-tailed)	Decision
	Coastal	Forest				
HCR	0.76	0.60	-2.655	238	0.008	Reject
FIGi	-0.34	-0.26	-1.816	163	0.071	Reject
SFIGi	0.15	0.16	-0.538	163	0.591	Accept
SI	0.40	0.41	-0.092	75	0.927	Accept

Source: Field Survey, 2012

The T-test results showed Head-count ratio (HRC) was significant at 1% level. This implies that farming households in the forest communities were more food secure than farming households in the coastal communities. Food insecurity gap measures the depth of food insecurity. In other words it measures the percentage of calorie required to raise food insecure households to meet the threshold of food security. The T-test indicates that the food insecurity gap was significant at 10% level (i.e. that there is a significant gap between recommended calorie intake and actual calorie intake, in both the forest and the coastal communities). Further, the results reveal that the depth of food insecurity was higher in the coastal communities (-0.34) than the forest areas (-0.26), (Table-5). Thus, the values of food insecurity gap implies on average that, food insecure households in the coast require an additional 34% of what they consumed to become food secure whilst those in the forest require an additional 26% of their what they consumed to meet the threshold of food security. In other words, food consumption level of food insecure households fell short by 34% and 26% in the coast and the forest, respectively to meet the threshold of food security. However, the t-tests on Square Food Insecurity Gap, and Surplus Index were not statistically significant.

CATEGORIZATION OF FARMERS BASED ON THE MAJOR GROWING CROP AND FOOD SECURITY INDICES

Table-6 presents the groups of farming households based on the major crops they cultivate and their food security indices. Table-6 shows that majority of the farming households (88.3%) in the Coastal communities were found to be food crop producers, with tree crop and vegetable farmers constituting 6.7% and 5%, respectively. However, both the tree crops as well as the vegetable farmers cultivated food crops for consumption but the major source of their income and food came from either the tree crop or vegetables. The result revealed majority (75.5%) of food crop farmers were food insecure and none of the tree crop farmers was found to be food secure. Though there was low representation of vegetable growers; half (50%) of them were food insecure. The overall result showed few (24.2%) farming household were food secure and majority (75.8%) were food insecure in the coastal communities.

Analysis of the composition of farming households in the forest communities revealed tree crop farmers were in the majority (85.8%), however, only 41.7% of them were food secure. Vegetable farmers recorded the lowest percentage (0.8%) whilst food crop farmers constituted only 13.3% of total farming households in the forest communities. Among the food crop farmers, 31.3% were food secure whilst the higher proportions were food insecure. The overall result of the forest communities showed less than half of the farming households (40%) were food secure. Among the food insecure households, 7.5% of them consumed 50% less than their daily calories requirements and 28.3% of farming households consumed between 50 to 75% less than their daily calorie requirement.

Table- 6: Categorization of farmers based on the food security indices and major crops cultivated

		Food Insecurity Indices of Farming Households					Total
Farmer Groups based on crops grown		**0 - 0.25**	**0.26 – 0.50**	**0.51 - 0.75**	**0.76 - 0.99**	**≥1**	
Coastal communities							
Food crops farmers	Freq	1	13	42	24	26	N=106
	%	0.8	10.8	35.0	20.0	21.7	88.3%
Tree Crops farmers	Freq	0	0	6	2	0	N=8
	%	0.0	0.0	5.0	1.7	0.0	6.7%
Vegetables farmers	Freq	0	0	3	0	3	N=6
	%	0.0	0.0	2.5	0.0	2.5	5.0%
Total	Freq	1	13	51	26	29	N=20
	%	0.8	10.8	42.5	21.7	24.2	100%
Forest Communities							
Food Crops farmers	Freq	0	2	4	5	5	N=16
	%	0.0	1.7	3.3	4.2	4.2	13.3%
Tree Crops farmers	Freq	1	6	29	24	43	N=103
	%	0.85	5.5	24.2	20.0	35.8	85.8%
Vegetables farmers	Freq	0	0	1	0	0	N=1
	%	0.0	0.0	0.8	0.0%	0.8	0.8%
Total	Freq	N=1	N=8	N=34	N=29	N=48	N=120
	%	0.8%	6.7%	28.3%	24.2%	40.0%	100%

Source: Field Survey, 2012

Factors Influencing Food Security Status of Farming Households

In determining the factors influencing food security status of farming households, food security indices of farming households were regressed on socio-economic characteristics of households.

The empirical results of Logit regression model presented in Table-7 revealed that level of education, dependency ratio and quantity of own food production are relevant in influencing food security status of farming households in the coastal communities. On other hand, in the forest communities, total annual income, access to credit, dependency ratio, and quantity of own food production are the factors influencing the food security status of the households. It is worth noting that all the significant variables in both the coastal and forest communities meet their a priori expectations. It is worth noting that the two variables: dependency ratio and quantity of own productions are significant in influencing food security status in both the forest and coastal communities.

Table-7: Marginal Effects of Logit Regression Results of Factors Influencing Food Security Status of Coastal and Forest Farming Households

	Coastal			Forest		
Variables	**Marginal Effect**	**Standard Error**	**P-values**	**Marginal effect**	**Standard Error**	**P-values**
Agehh	-0.0192	0.0180	0.287	-0.0594	0.0365	0.104
Farmsize	0.0161	0.0104	0.123	-0.0028	0.0521	0.957
Offfarm	-0.1194	0.0831	0.150	-0.1418	0.1688	0.401
Annincome	8.36e506	0.00002	0.617	0.0001	0.00004	0.002
Edu_lev	0.0838	0.0374	0.025	0.1058	0.0799	0.185
Aces2crdt	0.0248	0.1746	0.887	0.4785	0.1445	0.001
Lnownership	0.0733	0.0746	0.326	0.1200	0.1514	0.428
Dep	-0.0607	0.0189	0.001	-0.1483	0.0529	0.005
Gender	-0.2202	0.1463	0.132	-0.2879	0.1799	0.109
Ownfprtn	0.0226	0.0067	0.001	0.0257	0.0087	0.003
Agesquared	0.0002	0.0002	0.423	0.0005	0.0003	0.132
	Number. of Obs = 120			Number of Obs = 120		
	Wald chi2 (11) = 44.20			Wald Chi2 (11) = 29.66		
	Prob> 0000 = 0.0000			Prob> Chi2 = 0.0018		
	Pseudo R2 = 0.4127			Pseudo R2 = 0.4917		
	Log pseudo likelihood = -38.97338			Log pseudo likelihood =41.0503132		

Source: Field Survey, 2012

The level of education of household head is significant and positive in the coastal communities but not significant in the forest communities. The possible reason for this result could be that coastal communities have more civil and public servants due to their closeness to towns and cities. These civil and pubic servants double as farmers, hence, as their educational levels increase; they obtain gainful employment to support households' income which improves their food security status. However, farming households in the forest communities are full time farmers and are not involved in other jobs (i.e. off-farm activities). Total annual income was observed to be significant and exert positive influence on food security status among farming households in the forest communities, but not significant in the coastal communities. The possible reason attributed to this result is that

farming households in the forest communities received higher income from the sale of cash crops such as cocoa, oil palm and others. Additional income from sale of cash crops enabled farming households in the forest communities' to increase their food consumption basket, hence, improving their food security status. Access to credit though, significant and positive among farming households in the forest communities is not significant in the coastal communities. The probable reason for this result could be that farming households in the forest communities receive credit or pre-financing from produce buying companies which help to improve their food security status. According to the tree crop farmers who received credit, produce buying companies gave them kind credit in a form of inputs such as fertilizers; agro-chemical and others to commit the farmers to sell their farm produce (cocoa, coffee and oil palm) to them after harvesting. Tree crops can also be used as collateral to obtain cash credit from produce buying companies. However, farmers in the coastal communities lack collateral to obtain credit from formal source and, hence, rely on money lenders who charge higher interests on the loans obtained, which further aggravate their poverty and food insecurity situation.

The empirical results of this study are consistent with existing literature. The positive and significant coefficient of the education variable in relation to food security is consistent with the following studies: Herzeet et al. (1991); Shaikh, (2007); Adenegan and Adewusi, (2007); Oni et al. (2011); and FAO, (2012). The positive relationship between access to credit and food security is consistent with Bogale and Shimelis, (2009); and Pappoe, (2011). The positive relationship between quantity of own farm production and the extent of food security is in line with Babatunde et al. (2007); Quainoo, (2010); Ojogho, (2010) and Pappoe, (2011). The positive relation between total annual income and the extent of food security of the household agrees with the findings of Omotesho, (2006); Babatunde et al. (2007); Adenegan and Adewusi, (2007); and Arene and Anyaeji, (2010). Moreover, the empirical finding regarding the negative relationship between Dependency Ratio and food security status of the household is consistent with Feleke et al. (2003); Ojogho, (2010); Etim and Patrick, (2010) and Orewa and Iyanbe, (2010).

CONCLUSIONS AND RECOMMENDATIONS

The study seeks to examine the food security status of farming households in the Coastal and forest belts of the Central region of Ghana. A multistage sampling technique was used to select the households that were interviewed using structured questionnaire. In all, data was obtained from 260 households for the analysis (i.e. 120 and 140 households from the forest and Coastal belts, respectively). It is worth noting that of the 260 households that were interviewed, data was obtained from 1690 individuals for the analysis of the food security status of the households. These 1690 individuals consist of 851 and 839 individuals from the Coastal and forest communities, respectively.

In establishing the food security status of the respondents' household using GSS (2000) standard of 2900kcal, the result revealed that that majority of the respondents were food insecure. The results further showed that farming households in the forest areas were less food insecure compared to their counterpart in the coastal areas. The depth of food insecurity among farming households in the Coastal communities were higher than those in the forest communities. These results imply that food insecure farming households in the coastal areas consume far lower than their recommended daily calorie intake than food insecure households in the forest areas. Food crop farmers are the most affected in terms of food insecurity compared to the other groups of farmers (i.e. Tree Crop and Vegetable Farmers). The empirical results of the Logit Model Regressions reveal that the food security status of the farming households are influenced by the dependency ratio, and quantity of own farm production. In addition, others factors such as access to credit, and total annual income improve food security status of farming households in the forest communities but not in to coastal communities. However, higher education improves food security status of farming households in the coastal communities but not significant among farming households in the forest communities.

In the context of policy implications, first the Government of Ghana should widen the pro-poor policies such as Livelihood Empowerment against Poverty (LEAP) and school feeding programmes to cover larger poor households especially those in the coastal areas who were highly food insecure. In this respect, priority should be given to the farming households in the Coastal areas in terms of the implementation of pro-poor policies. Second, farming households should be encouraged to increase area of land under cultivation through land reform programme to reclaim marginal land to make them available for cultivation of crops. Furthermore, backyard gardening should be encouraged to enhance availability of food to the households, as quantity of own food production increases the chances of household being food secure. Third, it is imperative that the Government of Ghana intensifies the education and sensitization of families regarding family planning since higher dependency ratio within the households worsens the food security status of these farming households. Thus, families should be educated on the need to give birth to the number of children they can comfortably and effectively cater for. The establishment of virgin clubs or girl child education fun clubs in the basic schools to educate children on effects of teenage pregnancy etc., would be a step in the right direction. Fourth, the Government of Ghana in collaboration with the formal and informal financial institutions should work to together to ensure the availability of production credit to these farmers. The production credit, when obtained on time would increase chances of household to acquire productive resources (seeds, fertilizers, pesticides and others) which will boost production and improve food situation in the household. This recommendation is consistent with the result that access to credit significantly influenced the food security status of the household. Finally, as total annual income significantly influenced the food security situation of the household, the provision of consumption credit to the farming households by the Government in collaboration with the formal and informal financial institutions increases household's income on short term basis. This would in turn increase the consumption basket of households, thereby improving their food security situation.

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