Analysis of Food Security among Cocoa Producing Households in Ghana

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Abstract

This study was conducted to determine food security status and analyze factors that influence food security status among cocoa producing households in the Wassa Amenfi West District in Ghana. Using data from 320 randomly selected cocoa producing households, the results show that 67% of the sample households were food insecure indicating high level of food insecurity among cocoa producing households. In particular, female-headed households were found to be more food insecure than male-headed cocoa producing households. The results from a logit model showed that factors including the gender of household heads, age of households' heads, household size, years of schooling, annual cocoa output, and household non-agricultural income significantly influence food security status among cocoa producing households in Ghana. The results suggest that policies to improve cocoa productivity would be particularly useful due to the high impact this has on household food security.

Key words: Food Security, Cocoa, Ghana, Rural Households, Dietary Diversity Score.

Introduction

The production and export of cocoa (*Theobroma cacao*) has served as a major source of foreign exchange for many developing countries particularly in Sub-Saharan Africa (SSA). Cocoa was first introduced to Ghana by Teteh Quarshie from Fernando-Po in 1876, and the crop has grown to become one of the major export commodity for the Ghanaian economy. Cocoa production in Ghana is mainly by smallholders having 2 to 3 hectares and cumulatively cultivate an area of about 1.9 million hectares (Goodman, 2017). According to the Ghana Cocoa Board, the average yield of cocoa in Ghana is about 400 kg/ha (COCOBOD, 2017).

Ghana continues to earn substantial amount of foreign exchange from the crop, and in 2015, the country earned $1.7 billion from cocoa exports (BOG, 2016). During the 2015/2016 harvesting season, Ghana produced approximately 800,000 metric tonnes of cocoa, which was 20% of the total world harvest, making Ghana the third largest producer of cocoa (ICCO, 2017). According to the Ghana COCOBOD, about 70% of total production is exported and about 30% is locally processed into products including pastes, butter, confectioneries and chocolate (COCBOD, 2017). Major importing countries of Ghana's cocoa include the USA, Canada, the EU, Asia, Brazil and South Africa.

Due to the importance of coca to the Ghanaian economy, the welfare of the actors along the cocoa value chain particularly producers, is important to the success of the cocoa sector of Ghana. Of particular interest to this study is the food security situation of coca producers in Ghana. Many empirical studies including Darkwah and Verter (2014), Verter and Becvarova (2014), and Yeboah *et al* (2008) have been conducted regarding Ghana's cocoa production and export, however, few studies have been conducted regarding the welfare of the producers of cocoa, particularly the analysis of their food security status.

Improving food security status among cocoa producing households in Ghana is relevant for increased labor productivity on cocoa farms. Previous studies including Yoo

et al (2009), Smith *et al* (2000), and Galler and Barret (2001) have found a strong positive relationship between improved food security among farm households and their labor productivity as well as school performance among children. Since many farmers in Ghana, including cocoa farmers depend primarily on their manual labor to perform most of their farming activities, improving their labor productivity is a key component to increasing productivity of cocoa in Ghana.

Using data from 320 cocoa producing households and appropriate econometric analysis, this study was conducted to determine the status of household food security among cocoa producers and also to analyze the factors that influence the food security status of cocoa producing households in the Wassa Amenfi West District of Ghana. This provides policy implications towards increasing cocoa production in Ghana through interventions that aim at improving household food security status among producers of cocoa in Ghana and other parts of the world.

Methods and Procedures

Study Area

The study was conducted in the Wassa Amenfi West District, which is made up of about 150 communities in the Western Region of Ghana. The District is located in the middle part of the Western Region and has a total land area of about 1,448.556 square kilometers. It lies between latitude 5 30′N and 6 15′N and longitude 1 45′W and 2 11′W. According to the Ghana Statistical Service (GSS), the population of the District is 106,869 with a growth rate of 2.5% per annum with 2010 population as the base of which 49% were female (52,366) and 51% being male (54,503) (GSS, 2010). Agriculture is the main economic activity in the district and the most common cash crops grown include cocoa, oil palm, and rubber and the major food crops produced include cassava, maize, rice, and tomatoes.

Sampling Technique

According to the District Department of Agriculture, the District is divided into four zones, which are further divided into operational areas, and each operational area is supervised by an Agricultural Extension Agent (AEA). Cocoa producing households were chosen across the four zones to ensure that results obtained are representative of the district. Multistage sampling was employed for this study. During the first stage of sampling, the Wassa Amenfi District was purposively selected from the 22 Districts in the Western Region of Ghana because it is one of the main cocoa producing districts in Ghana. The second stage involved a random selection of 5 communities in each of the 4 zones in the District. In each of the 5 randomly selected communities, 16 cocoa producing households were randomly selected making a total of 320 households' for the interview.

Determining Food Security Index

For this study, household dietary diversity score (HDDS) was used as an index to assess cocoa producing households' food security status. The HDDS is one of the direct outcome indicators which is related to food and nutrition security and it is widely used in developing countries (Maxwell *et al*, 2013), and it is based on 10 food groups according to Swindale and Bilinsky (2013). In determining the household dietary diversity score and following Ruel (2002), the food items that households' responded to have eaten over the last 24 hours, as stated in the survey questionnaire were grouped into ten food categories namely cereals and grains; white roots and tubers; vitamin A rich vegetables and tubers; dark green leafy vegetables and other vegetables; vitamin A rich fruits and other fruits; organ meat and flesh meat; eggs, fish and seafood; legumes, nuts and seeds; milk and milk products; and oils and fats. A household was scored one for a particular food group if a member of that household consumed any food item belonging to that particular food category. A household was given a score of 0 for a particular category if members of that household had not consumed any food item belonging to that particular

food category during the past 24 hours. According to Kennedy *et al*, 2011 and Baliwati *et al* (2015), it has been established that a household is classified as food insecure if its diversity score is less than six various food irrespective of geographical location of the household. This study categorized the sampled households into food secure households and food insecure households based on the diversity score obtained by the household .

Model Estimation Procedure

Following Mannaf and Uddin (2012), the logit model was used to estimate the food security status of cocoa producing households as a function of a set of independent determinants. The logit model was used because the dependent variable (food security status) which was measured by the HDDS of a household is a binary categorical variable. According to Cameron and Trivedi (2005), the logit model is specified as:

$Logit\ (P_i) = ln\ (\frac{P_i}{1-P_i}) = \alpha + \beta_i X_i + \varepsilon_i$………………….. (1)

Where:

P_i = the food security status of *i*th household; X_i = Vector of explanatory variables; ε_i = Error term; and β = Vector of parameter estimates. The probability that a household is classified in any of the food access categories is restricted to lie between zero and one ($0 \leq P_i \leq 1$). For this study, the explanatory variables used include gender of the household head, age of the household head, marital status of the household head, years of schooling of the household head, household size, annual household cocoa output, household ownership of livestock, monthly household food expenditure, annual household agricultural income, and annual household non-agricultural income.

Results and Discussion

Summary Statistics

Table 1 shows the summary statistics of the variables used in this study. The Table show that 91% of the households were headed by male while only 9% were headed by females. This result reflects the cultural and religious dispositions of the study area that confers household headship and responsibilities of sustaining the household economy to males. Also, Table 1 shows an average age of 48 years among the respondents. This shows that most of the respondents are in their active work phase of life and can engage in various income generating activities. The Table further shows that educational level of respondents is generally low at an average years of schooling as 9 years, which is Junior High School level by Ghanaian standards. The result in Table 1 also revealed that the sampled households had between 3–8 persons per household with an average of 4 persons per household. The results further show an average household dietary diversity score of 5.6 which is lower than the national household dietary diversity score for farming households. This is an indication of high incidence of food insecurity status among the sample households.

Table1: Summary Statistics

Variable	Mean	Standard Dev.	Min.	Max.
Gender (1=female, 0=otherwise)	0.91	0.29	0	1
Age (years	47.74	2.11	36	60
Marital Status (1=married, 0=otherwise	0.87	0.34	0	1
Years of schooling (years)	9.76	6.16	0	20
Household Size (number)	4.00	0.81	3	8
Annual Cocoa output (kg/ha)	366.83	65.71	252	479
Livestock ownership (1=yes, 0=no)	0.74	0.44	0	1
Annual Agricultural income (GHC)	1648.62	514.20	765.00	2498.00
Annual Food Expenditure (GHC)	1152.42	358.84	525.50	1748.60
Annual Non-Agricultural income (GHC)	497.61	166.33	204	800
HDDS	5.61	0.95	3	7

Household Food Security Status

Table 2 show the status of food security among cocoa farmers in the Wassa Amenfi-West District. The Table shows that 61% of the sampled households had their dietary diversity score below the national average and indicating high level food insecurity in the study area. This suggests that many households in the study area consume less diverse meals and thus are food insecure. This results is similar to previous studies including Smith *et al* (2006), Gebrehiwot and Van der Veen (2015) and Antwi (2018) which also found high food insecurity levels among farming households in different parts of Africa.

Table 2: Food Security Status

Food Security Status Category	Number of Households (N=320)	Male Headed Households (N=290)	Female Headed Households (N=30)
Food Secure	106 (33%)	176 (61%)	11 (37%)
Food Insecure	214 (67%)	114 (39%)	19 (63%)

Also Table 2 shows that food insecurity is high among female headed households than male headed households as 61% of female headed households were found to be food insecure as compared to only 33% of male headed households. Further analysis show that male headed households have higher HDDS than female headed households and the difference was found to be significant (*t=2.056, p=0.021*).

Determinants of Food Security Status

Table-3 shows the result of the logit analysis of the factors that influence food security among cocoa producing households in Ghana. The Chi-square value of -87.7 is significant, indicating that the overall model has a good fit to the data. Out of the ten independent variables used in the model, eight variables including gender of the

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household head, age of the household head, years of schooling of the household head, household size, annual cocoa output, annual agricultural and non-agricultural income, and expenditure of food were found to be significant.

Table 3: Determinants of Food Security Status

Variable	Coeff.	Std. Error	Sig.	Odds Ratio
Constant	0.444	0.544	0.751	1.559
Gender	0.581	0.054	0.029**	0.563
Age	0.103	0.012	0.055*	0.011
Age^2	-0.091	0.004	0.031**	0.138
Marital Status	0.354	0.541	0.518	0.709
Years of Schooling	0.197	0.028	0.033**	0.812
Household size	-0.217	0.012	0.017**	0.981
Cocoa output	0.069	0.001	0.071**	0.993
Livestock ownership	0.131	0.334	0.694	0.877
Food expenditure	0.041	0.003	0.023**	0.996
Non Agricultural income	0.006	0.001	0.039**	1.004

Log Likelihood = -87.7; Chi2 = 104.78; *** $p<0.01$, **$p<0.05$, *$p<0.1$

The coefficient for gender in Table 3 has a positive relationship with household food security status, and the relationship is significant at 5%. The results show that the food security status of a household increases by 0.56 if the household is headed by a male. This suggests that households headed by a male has higher probability of being food secure than the female headed households. This result is expected because female household heads in the study area have additional responsibility of home keeping and raising children which usually restrict their involvement in income generating activities. Antwi (2018), Ntwenya *et al* (2015) found similar results among food crop production famers in Africa. Similarly, Felker-Kantor and Woode (2012) found similar results in

Brazil, and attributed their findings to high poverty levels among female-headed households.

The coefficient of age was found to be positive among the sample household at 1% significance level. This suggests that as household heads advance in age, their food security status increases. An increase in the age of household head increases the probability of a household to be food secure by 1.011. The result further shows that as a household head advances in age, the food security status of the household declines. This could be attributed to the fact that the productivity of old household head declines as they get older which impacts negatively on their households' food security status. This result is in consonance with Agbola (2004) and Aidoo *et al* (2013) who found that increase in age beyond a certain threshold decreases the food security status of the household.

As expected, the coefficient of years of schooling was positive and also significant at 5% level. The logit result shows that as the level of education of household heads increases, the food security status of the household increases, and a unit increase in the years of schooling increases household food security by 0.98. This suggests that the level of formal education could impact positively on the household production and nutrition decision thereby reducing food insecurity intensity. The awareness of food groups needed for human growth and development may be reliant on the level of education of the household head. The knowledge of these food groups ultimately influences nutritional decisions that improves quality food intake among household members. Previous studies including Eicher-Miller *et al* (2011), Bawadi *et al* (2012), and Bamire (2010) obtained similar results. Also, results of a study by Mutisya et al (2016) showed that increased household education attainment was positively correlated with an increase in the probability of being food secure.

The results show an inverse relationship between household food security status and household size. It indicates that a unit increase in household size reduces the probability of household to be food secure by 0.812. This result is expected because

increase in the member of household means more people eating from the same resources, hence, household members may not be able to take enough food when compared to a situation with smaller household size, thus increasing the probability of the household to be food secure. Similarly, Habyarimana (2015) found that large family size among households in Rwanda increases the probability of a household to become food insecure. Also, Abele *et al* (2015) found similar results in Uganda and explained that the larger the family size of a household, the smaller the per capita calorie intake from food production.

A unit increase in output of cocoa increases the probability of household to be food secure by 0.993. Cocoa, being a cash crop among most of the households in the study area enables household generate more income. This is particular so in a situation where the government of Ghana increases the producer price of cocoa annually (Goodman AMC LLC, 2017). Previous studies by Agbola (2004) found similar results among Nigerian cocoa producers in the Ondo State in Nigeria. The results further show that a unit increase in non-agricultural income increases household food security status by 1.004. Though the demand for food is inelastic, previous studies including Habyarimana (2015) and Zakaria *et al* (2014) found that household expenditure on vegetables and fruits, which improve dietary diversity increases as household income increases. Also, in an area where households spend more than 70% of their annual income on food, income from increased output and non-agricultural income become important variables in determining households' food security status.

Conclusion and Policy Implication

The study determined the food security status of cocoa producing households and analyzed the factors that influence food security status among these households in the Wassa Amenfi West District in Ghana. The study was necessitated due to the significance role cocoa exports play in the development of the Ghanaian economy. Results from the study showed high level of food insecurity among cocoa producing households in the

study area, which was found to be worse among households that are headed by females. Results from a logit regression analysis found gender of the household head, household size, annual coca output of household, years of schooling of household head, and household food expenditure as some of the factors that influence food security among cocoa producing households in Ghana.

For policy implications, it is imperative that policies that are aimed at improving food security status among cocoa producing households in the study area are implemented. In implementing these policy interventions, factors including the gender of household heads, age of households' heads, years of schooling, and annual cocoa output should be taken into consideration to achieve maximum impact. In particular, policies targeted at improving the productivity of cocoa such as the *mass cocoa spraying exercise* should be enhanced to help improve food security status among cocoa producers through increased cocoa productivity.

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