ASSESSING THE FOOD SECURITY STATUS AND PRODUCTION CONSTRAINTS OF COCOA FARMING HOUSEHOLDS IN THE ASHANTI REGION

BY

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DECLARATION

I, **BENJAMIN TAYLOR**, hereby declare that this thesis, "**Assessing the food security status and production constraints of cocoa farming households in the Ashanti Region**", consists entirely of my own work produced from research undertaken under supervision and that no part of it has been published or presented for another degree elsewhere, except for the permissible citations/references from other sources, which have been duly acknowledged.

Attached in appendix 9 is a Plagiarism Report on this study.

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DEDICATION

To my unborn children and generations after me. Again, to my grandmother; Madam Cecilia Ofori (Esi Awotwe) and uncle: Mr. John Mensah, for believing in me. I am most grateful to God for their lives.

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Unto the Lord be the glory, great things He has done and greater things He will do! I am overwhelmed by the mercies and favour of God seeing me this far, I praise His name. Amen.

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It's my prayer that the good Lord bless you beyond measure. Amen.

ABSTRACT

Food security is 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. Foreign income generated from cocoa production serves as the backbone of the economy of Ghana, yet the high poverty prevalence amongst cocoa farming households affect greatly their food security status which in the long run leads to low production outputs. Therefore, this study seeks to assess the food security status and production constraints facing cocoa farming households in the Ashanti Region of Ghana. A multistage sampling technique was used to select the households that were interviewed using a structured questionnaire. In all, 260 household heads were interviewed that is, 130 households from Asante Akim South and Ahafo Ano South Districts. The study adopted the RDCI approach using the IFPRI/GSS standards and the results revealed that, 73% and 27% of the households were food secure and insecure respectively. The Logit regression used to estimate the determinants of food security status of cocoa farming households showed six (6) of the independent variables (age of household head, household size, dependency ratio, own food production, adult working income and value of economic assets) to be statistically significant. Only own food production and value of economic assets influenced food security of the households positively. The study showed that, the most pressing constraints of cocoa production are high cost of inputs, pest and diseases and inadequate supply of government subsidized input chemicals. It was then recommended that government subventions focused on the cocoa sector such as fertilizers, pesticides and weedicides should be delivered to the farmers on time and also efforts should be made to improve income earning capacity of households and access to credit by the needy. Family planning education should be intensified in order to reduce their dependency ratio.

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ABBREVIATIONS AND ACRONYMS

ADB	Agricultural Development Bank
AHM	Agricultural Household Models
BECE	Basic School Certificate Examinations
DCI	Daily Caloric Intake
DCR	Daily Calorie Requirement
ERP	Economic Recovery Programme
FAO	Food and Agriculture Organization
FBO	Farmer Based Organisation
FDI	Foreign Direct Investment
FGT	Foster Greer and Thorbecke
FIG	Food Insecurity Gap
FSI	Food security index
GAIN	Global Agricultural Information Network
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GNP	Gross National Products
GOG	Government of Ghana
GSS	Ghana Statistical Service
HCR	Head Count Ratio
ICCO	International Cocoa Organization
ICI	International Cocoa Initiative
IFPRI	International Food Policy Research Institute
ISSER	Institute of Statistical, Social and Economic Research
JHS	Junior High School

JSS	Junior Secondary School
KCAL	Kilocalorie
LEAP	Livelihood Empowerment Against Poverty
MICS	Multiple Indicator Cluster Survey
MLGRD	Ministry of Local Government and Rural Development
MOFA	Ministry of Food and Agriculture
MOFEP	Ministry of Finance and Economic Planning
MOGCSP	Ministry of Gender, Children and Social Protection
MOH	Ministry of Health
MSLC	Middle School Leaving Certificate
NGO	Non-Governmental Organisation
NHIS	National Health Insurance Scheme
PDA	Participatory Development Associates
RDA	Recommended Daily Allowance
RDCI	Recommended Daily Caloric Intake
SAP	Structural Adjustment Programme
SFIG	Square Food Insecurity Gap
SPSS	Statistical Package for Social Sciences
SSCE	Senior School Certificate Examination
UNDP	United Nations Development Programme
UNICEF	United Nation Children's Fund
USAID	United States Agency for International Development
WCF	World Cocoa Foundation
WFP	World Food Programme

CHAPTER ONE

INTRODUCTION

1.1 Background

A basic necessity of life is food as explained by Maslow's theory of need. According to Datt *et al.,* (2000), inadequate nutrition is considered a critical yardstick for poverty in many communities around the world. Jensen (2002), states that the assurance of food availability ensures several advantages including stability in terms of the political atmosphere and people coexisting peacefully in the country whilst food insecurity causes low performance of in both children and adult due to poor health.

Food security can generally be considered as a situation mostly associated with the provision of food, one's access to it and ability to utilize it for normal body functions. The term "food security" was further explained with a focus on 'supply' during the World Food Conference (1974). Food security was explained as the "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices". Later attempts at the definition of 'food security' added demand and access related issues to the concept of food security. During the World Food Summit (1996), it was concluded that there is food security "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."

The concept of food security in developing and middle income countries is linked to issues related to poverty reduction and alleviation and also guaranteeing a sustainable socioeconomic development of a nation. The realization of food security lies at the heart of the challenges confronting farming households and this is largely due to seasonality of production cycles, low

productivity, limited economic opportunities, poor habit of savings, price fluctuations as well as variability in food supply. The array of food related problems facing farmers are due to the unsuitable application of agro-chemical inputs coupled with the use of insufficient enhanced varieties, insufficient access to critical public goods and facilities and the overreliance on rain-fed agriculture.

Cocoa is a major cash crop and the source of significant foreign currency earnings in Ghana. Cote D'Ivore is the world's leading producer of cocoa followed by Ghana. Cocoa cultivation is not only native to these countries, it is also cultivated within several developing countries and known to be one of the most standardized commodities with regard to its acceptability and usage in the world.

Cocoa is produced in six (6) of the ten (10) political regions in Ghana. This is due to the geographic and ecological difference of the regions. The Western Region recorded the highest amount of cocoa output (50% of overall national output). Ashanti Region follows (recording 16% of overall national output). Both Eastern and Brong Ahafo Regions together produce 19 percent of total national production whilst the Central and Volta Regions produce the remaining 15 percent (COCOBOD, 2012).

According to GAIN (2012), farmers engaged in cocoa production in Ghana still rely on the indigenous practices and ways of production such as the use of cutlass and hoe for farming. "Cocoa cultivation in Ghana is also predominantly rain fed and the best conditions for cocoa farming are those in which there is favorable rainfall during the night followed by sunny days as these result in healthy looking trees with fully filled pods" (GAIN, 2012). The major cropping season for cocoa in Ghana is from October to February/March and the minor or light crop season occurs during April/May to September (GAIN, 2012). "In order to maximize foreign currency earnings, the Ghana Cocoa Board (COCOBOD) also introduced an extended

duration for harvesting and marketing in the longer crop seasons for the main crop (October to May) and limited the duration for the light crop season (June to September) as the light crop beans are typically smaller in volume in comparison to the main crop variety, although the same type of bean quality is cultivated" (GAIN, 2012).

All cocoa produced in Ghana except that which is smuggled is mandatorily sold to the Cocoa Marketing Board. Another issue confronted with cocoa production in the country is the fact that most cocoa farms are medium in size. "About 700,000 households are growing cocoa mostly on plots of two to three hectares plantations" (ICCO, 2006). Granting that, majority of the cocoa farmers in the country are small scale farmers hence cultivating on small plots of land which are less than three hectares, only few of these cocoa farmers happen to control the trade. "Indeed, some studies show that about one-fourth of all cocoa farmers receive just over half of total cocoa income" (Clark, 1994). It has been observed globally that, cocoa producing countries generally cultivate small to medium land sizes and more specifically in Ghana 90 percent of cocoa produced are grown on small farms (COCOBOD, 2012).

Notwithstanding the small sizes of cocoa farms in the country, according to Vigneri (2007) production has experienced some increment over the years due to the following reasons;

- New lands acquired for cultivation/production
- Concentrated use of casual labour
- Effective farm spraying
- Increased fertilizer and chemical use

Despite this production increase there are some major constraints affecting farmers in attaining the optimal output levels. Studies by Kolavalli and Vigneri, (2003), and Vigneri, (2007) suggest that cocoa farmers in Ghana are yet to make full use of technology and modern innovations in their cultivation, so that the output is sustainable over time. Cocoa farmers make

use of intensive casual labour and this has led to a rise in the cost of man-power (labour) and may negatively affect profitability.

"Ghana's cocoa yield has been on average 25 percent less than the average yield level of the ten largest cocoa producing nations and nearly 40 percent below the average yield level of neighboring Côte d'Ivoire" (Mohammed *et al.,* 2011). The possible reasons attributed to the country's low yields consist the aged cocoa trees, pests and diseases, and insufficient investments in cocoa farming coupled with the non-practice and or the strict adherence to the planting in widespread rows system (Mohammed *et al.,* 2011).

One needs a good appreciation of the cocoa sector in Ghana and all the processes farmers go through to enable him or her conduct a study aimed at enhancing the lives of such farmers. This in a long run translates into enhancing the processes geared at increasing production output and food security of cocoa farmers.

1.2 Problem Statement

Food security has generated a lot of debate in Africa. Literature shows that the per capita food production has declined in several parts of Africa in the last two decades (FAO, 2010).

Indeed, it has been reported that while millions of people in the industrialized countries often are worried about dietary diseases which stems from excessive intake of food, ironically, double that number of people in developing countries are actually faced with hunger emerging from the lack of food on daily basis. "There are over 800 million people globally suffering from inadequate food intake; about 700 million are in the developing countries among whom over 100 million are found in the Africa" (Pinstrup-Andersen, 2009). It is reported in FAO, (2013) that, 78 percent of the total number of people suffering from inadequate food intake are living in under-developed areas of developing countries. Majority of the rural dwellers in

Ghana are crop farmers and are mostly affected by this inadequate food intake as a result of food insecurity.

"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, and Ruivenkamp, 2005). According to Windfuhr and Jonsén (2005), several reasons account for the lapses in the effective implementation of policies geared toward addressing food related crisis, paramount among them are that, ineffective coordination among government and non-governmental agencies tasked to see to the implementation of the policies, also the few rich or wealthy people in the society controls most of the resources in the society and food security policies rather tend to promote privatization or capitalism.

"Available statistics indicate that the economy of Ghana is doing well at the macro level in terms of human development indices making Ghana one of the fastest growing economy in the world" (GSS, 2012). That notwithstanding, this effect (increased disposable income and standard of living) is yet to drip down to the micro level since improvements in the economy are not seen and experienced by the majority at the grass-root level. Recent developments around the globe and more especially Ghana in terms of food shortages, high food prices, climate change and increasing request for land for cocoa production in the country have made it essential to examine the present food security status of households of farmers in the cocoa sector who are already trapped in poverty (Kugelman, 2012).

The Services sector is the predominant economic area of Ghana employing about 80 percent of the country's working force currently engaged, that notwithstanding the Agriculture sector provides the highest percentage of people employed permanently (GSS, 2015). The

Agricultural sector employs about 800,000 households in cocoa farming representing 5.81 percent (COCOBOD, 2014). Cocoa is an important cash crop of the country and therefore ensuring the development of the cocoa sub-sector has significant implication on the quality of lives of key stakeholders in the sub-sector including farmers. The sector's growth offers a possible model of leading broad-based and ripple effect of reducing poverty incidence and raising the standards of living of the people (Kuwornu *et al.*, 2011).

Several factors affect the food security status of farmers' households in Ghana. Lack of adequate storage facilities, lack of financial credit and pressing need for cash to pay off debt are the major factors which push cocoa farmers to sell their produce at low prices at harvest and buy at high prices during the lean periods of production (Brinkman *et al.*, 2010).

The Ashanti Region continues to experience high rates of food insecurity due to high magnitudes of variance in the determinants of 'food security' in both rural and urban areas. These differences are due to the falling standards of factors such as the number of livelihood activities head of the household is engaged in and total own production of the household (Frimpong and Asuming-Brempong, 2013).

Understanding the food security status of cocoa farming households is very important since inadequate nutrition before the age of two years could result in permanent effects on an individual's physical and mental development as well as future potential (Victora et al., 2008). Also malnourished and food insecure farmers are prone to ill health and lack the resources to respond to technological changes in agriculture. Since agriculture is the predominant economic activity in Africa, and for the matter Ghana, employing the largest proportion of the population aged 15 years and above in their main job (GSS, 2016). It therefore has significant implication for Ghana's choice of development policy.

Cocoa is not a staple crop therefore farmers rely mostly on food crops predominantly (cassava, plantain, cocoyam and rice) for their source of food and alternative incomes for sustaining

themselves, families and farming activities. Cocoa is a perennial crop therefore at the early stages of cocoa production, there are high initial costs which are then followed by more steady yearly returns after five years that are non-linear over the life span of the cocoa trees (Nkang *et al.*, 2007). Given the growing cycle, cocoa farmers would have to look elsewhere or consider other alternative streams of income for their livelihood awaiting the major streams of income from the output of cocoa after it has been harvested and sold which happens from September to March for the main crop and from May to August for the minor crop.

Several food security studies have been conducted in Ghana especially in the three northern Regions (Northern, Upper East & Upper West). This is because these regions recorded the highest poverty headcount that is 70.7 percent, 50.4 percent and 44.4 percent for Upper West, Northern and Upper East Regions respectively (GSS, 2015). The few studies undertaken in the Ashanti Region with regard to food security focused on patterns of consumption and the comparative analysis in urban and rural areas (Frimpong and Asuming-Brempong, 2013; Frimpong, 2013). A study is yet to be conducted which assesses the food security status of cocoa farming households and production constraints together in the Ashanti Region. Therefore, the study seeks to address the following research questions:

1. What is the food security status of cocoa farming households in the Ashanti Region?
2. What are the factors influencing food security status of the cocoa producing households in the Ashanti region?
3. What are the food security indices of cocoa farming households in the study area?
4. What are the coping strategies adopted by cocoa farming households in the study area?
5. What are the constraints of cocoa production of farmers in the study area?

1.3 Objectives

The main objective of the study is to assess the food security status and production constraints of cocoa farming households in the Ashanti Region of Ghana using two districts.

To address the main objective of the study, the following specific objectives would be achieved:

1. To determine the food security status of cocoa farming households in the study area.
2. To estimate the determinants of food security status of the cocoa producing households.
3. To estimate and compare food security indices of cocoa farming households in the region.
4. To estimate and compare the index of coping strategies adopted by cocoa farming households of the two districts in the study area.
5. To identify and rank the constraints of cocoa production of the cocoa farming households.

1.4 Justification

Food security issues are of great concern to everyone whether a farmer or not, even to get the peace of mind to give out your optimal best in terms of mental and physical work. A study by the African Development Bank (2011) has found that almost half (44 percent) of the population of Africans lived on less than $1.25 per day in 2010, this makes the food security situation in Africa to be worrying. Considering the rate at which food prices fluctuate, the plight of people especially the poor in terms of food satisfaction will be deepened. The worst affected group of people by the high prices of goods and food commodities are those in the extremely poor brackets including farmers (Wiggins, 2009; Nagayets, 2005) and the urban poor (Jrad *et al.*, 2010).

This study will provide the needed information with regard to the food security status and associated challenges required to inform governmental agencies and ministries like the Ministry of Gender, Children and Social Protection (MoGCSP), Ministry of Health (MoH) and Ministry of Local Government and Rural Development (MLGRD) in drafting and implementing pro-poor policies such us the School Feeding Programme, National Health Insurance Scheme (NHIS) and Livelihood Empowerment Against Poverty (LEAP). These policies add to government's efforts in alleviating poverty and addressing issues associated with food insecurity and also improving citizens' standard of living.

The study again will help address some of the gaps in the implementation of policy recommendations to the COCOBOD such as the Cocoa Scholarships to the children of cocoa farmers, adequate and timely supply of cocoa inputs will relieve the farmers of some financial challenges and improve their production capacity which will empower them to effectively handle livelihood issues associated with hunger and poverty.

The findings of this study will assist Non-Governmental Organizations (NGOs) like the International Cocoa Initiative (ICI), World Cocoa Foundation (WCF) and the Participatory Development Associates (PDA) to gain more insight on issues of food security, cocoa production and other livelihood issues associated with cocoa farmers in the country and the Ashanti Region. Again, the study will aid NGOs to know the appropriate support to offer cocoa farmers and also know when to offer that support.

The study will contribute to existing literature and on-going discussion on food security in the world and Africa. This will provide solutions and alternatives for issues of food insecurity and production challenges of cocoa farming households in the Ashanti Region of Ghana.

1.5 Limitations

The study is limited to only two selected districts in the Ashanti Region of Ghana which are Asante Akim South and Ahafo Ano South. The major staple foods which are maize, cassava,

rice, yam, plantain were considered in addition to fruits, vegetables, meat and fish consumed by farming households to determine their food security status. The study also focused on two dimensions of food security (availability and accessibility) in assessing the determinants of food status in the study.

Utilization and nutritional safety are the other dimensions of food security. They fall outside the scope of this study so were not considered. Issues of food utilization and nutritional safety could be best researched in the field of Food Science and Nutrition not Agricultural Economics and Agribusiness hence the decision not to consider its analysis in this study.

1.6 Organization of the study

This study assesses food security status and production challenges facing cocoa farming households in the Ashanti Region of Ghana. It consists of five chapters. Chapter one presents an overview of food security status of cocoa farming households and its implication on cocoa production and the economy of Ghana. Chapter two reviews literature and research work conducted by others on diverse areas in the field of food security status estimation. Chapter three develops empirical models for achieving the specific objectives of the study beginning with the basic theory underlying the study as well as the conceptual framework linking the theory to field data collected. Chapter four discusses the results. Chapter five presents conclusions from the study and suggests some policy recommendations based on the findings and conclusions of this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines the literature on food security. The chapter is divided into three broad sections. Section one gives an overview of the definitions and concepts of food security. Section two explains the relationship between the concept of food security and cocoa production and also highlights trends of food insecurity and the negative effects on the cocoa farming households. Section two again deals with government's contribution to enhancing food security in Ghana. Section three considers empirical studies conducted by other researchers on the estimation of household food security, the effect of food security status on cash crop (cocoa) production, analysis of constraints to cocoa production, the methodologies adopted and their respective outcomes.

2.2 Food Security: Definitions and Concepts

The term 'food security' was first used in 1974 during the World Food Conference. It has since then become a common topic of interest in all countries in the world. Various institutions and researchers have fairly attempted defining food security. Maxwell and Frankenberger (1992) identified thirteen groups of definitions of food security. However, a popular definition of the term was the one propounded by World Bank in 1986.

The term 'food security' is defined as "access by all people at all times to enough food for an active and healthy life" (World Bank, 1986 – p8). This definition looks at food security in terms of food accessibility, availability as well as utilization of food for a healthy life. The Food and Agriculture Organization (FAO) added nutritional value and food preferences to the World Bank definition of Food Security. The FAO, (1996) defined food security as "situation

in which 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 addition of "safe and nutritious" highlights the importance of safety and nutritional elements, and the inclusion of "food preferences" broadens the concept of food security from just access to sufficient and enough food to the desired food (Pinstrup-Anderson, 2009). On the other hand, the working definition by the Ministry of Food and Agriculture (MOFA), (2007) for food security in Ghana is "good quality nutritious food hygienically prepared and packaged, attractively presented, available in sufficient quantities all year round and located at the right place at affordable prices".

Historically, food security was presumed as adequate supply of food only at the national levels until this notion changed in the mid-1970s. This assessment only considers food production oriented elements and neglected several factors which are very critical in affecting access to food, e.g. distribution and affordability. Evidence, however, shows that during the last two decades, food production has been increasing in the world (Quaye *et al.,* 2010). However, agriculture output growth in Africa lagged behind population growth and a large fraction of output growth has been the consequence of increased farm sizes of cereals rather than the gains in land use efficiency (Juttings, 2003; Quaye *et al.,* 2010). According to the GSS report (2014) on the country's GDP, "the Agricultural sector saw a growth of 5.2 percent in 2013, compared to 2.3 percent in 2012 with its contribution to the economy continuing to decline, with its share falling from 23.0 percent in 2012 of GDP to 22.0 percent in 2013". However, the situation in the growth of the agricultural sector is not getting better as the sector was expected to grow by only 0.04 percent in 2016 due to low investment by government (MOFEP, 2015).

Food security at the national, regional and local levels are not necessarily guaranteed by large amounts of food, simply implying that availability of enough food at national level does not

translate into household food security. A study by the United Nations Development Programme (UNDP) (1992) revealed that calorie supply for a healthy living of people at global level in 1990 was 110 percent of total requirement. However, in the same period, the number of people who suffered from acute famine exceeded 100 million and more than a quarter of the world's population was short of enough food (UNDP, 1992). Even though food production has been increasing in recent years, food insecurity, malnutrition and hunger and much more serious problems would remain the core agenda of the globe today (Barrett, 2002).

If a person or group of people lack one or more of the elements enumerated in the definition of food security as outlined by FAO (1996), then the person or the group could be said to be at risk of being food insecure. An additional dimension has been added to the concept of food security with the introduction of stable food supply and food nutrition safety in the definition of food security by MOFA (2007) and USAID (2008). Jrad *et al.,* (2010) expounded on five dimensions of food security and these are food availability, food accessibility, food utilization, stability of food supply and food nutrition safety.

Food Availability: means making and ensuring that sufficient or enough food is available and adequate by either own farm production, buying from local market or importing from a foreign market. "Food availability refers to the existence of food stocks for consumption" (Gregory *et al.*, 2005).

Food Accessibility: in a broad sense means food poverty reduction and alleviation. With food accessibility the food must be available at the good place at a good time and all people must have financial asset or power to purchase adequate, nutritious and safe food. According to Kuwornu *et al.,* (2011) "food access is determined by physical and financial resources, as well as by social and political factors". In other words, making food available is not enough until low income earners and households can afford to buy this available food.

Food Utilization: means ensuring the systems in the human body make the best use of the nutrients available in the food. UNDP (1995) described that food utilization is the ingestion and digestion of adequate and quality food for the preservation of an upright health and normal growth. "The proper biological use of food, requiring a diet that contains adequate energy and essential nutrients for growth as well as knowledge of food storage, processing, basic nutrition and child care and illness management all inures to the interest of food utilization" (Demi and Kuwornu, 2013).

The concept of food security can be further analyzed under spatial and temporal dimensions. The 'spatial dimension' refers to the degree of movement in the quality of food security considered at point in time. Hoddinott (1999) suggested that, it is possible to analyse 'food security' at the world, national, regional, district, community, household and individual levels. The 'temporal dimension' of food security speaks to the period during which food security is assessed. Most of the food security literature universally categorized temporal dimensions into two strata: chronic or transitory (Hoddinott, 1999; Tweenten, 1997; Devereux, 2006). According to Babatunde *et al.,* (2007), "***Chronic food insecurity*** is a long-term or persistent inability to meet minimum food consumption requirements and it is rooted in poverty; however, ***transitory food insecurity*** is a short-term or temporary food deficiency". "An intermediate category is ***cyclical food insecurity***, such as seasonal shortage of food due to bad harvest among others", (Babatunde *et al.,* 2007).

2.2.1 Measuring food security status of households

Procuring accurate data for food security analysis could be a tedious task. It becomes more difficult especially in situations where household structure is more diversified and the "household" itself is relative to varying degree of interpretations (Maxwell, 1996). The complexity is pronounced where there are various sources of income among adult members of

household and also when members are not willing to disclose fully their income and other assets to other members of the household. The issues of complexity is exacerbated where the responsibility to buy food or to produce food from own farm is shared among members of the family/household and also when the farm produce harvested are in piecemeal without any proper recording or measurement (Maxwell, 1996).

"Most food security analyses rely on measuring food consumption to overcome these shortfalls" (Maxwell, 1996). Bouis (1993) identified two most widely used methods for measuring food security even though the methods are subject to measurement constraints. The first method involved estimation of the increase or decrease in food stocks kept over a period of time and assumed that the food that is in the possession of the household but could not be accounted for has been consumed. On the contrary, "the second method undertakes a 24-hour recall of food consumption for households or individuals and analyses each type of food mentioned for caloric content" (Bouis, 1993).

Consumption surveys give an insight into what was consumed. "This is as a result of not only access to food but also households' food acquisition, allocation behavior and consumption" (Pinstrup-Andersen, 2009). "Though the latter method gives reliable result than former, it is subject to some drawbacks such as memory lapses, observer bias, respondent fatigue, a short and possibly unrepresentative recall period" (Maxwell, 1996). The collection of data is also very expensive in that inadequate resource often constrains analysis to relatively small samples (Maxwell, 1996). The first method is mostly employed by economists whilst the second is mainly used by food nutritionists.

The consumption approach is done by converting the total food intake of households into caloric contents and dividing it by the result of the households' adult equivalents. The adult equivalent of the caloric content of the foods consumed by the households is then divided by

number of days in a week (seven days) to arrive at the Daily Caloric Intake (DCI). The DCI of the household is then compared with the standard which is the Recommended Daily Caloric Intake (RDCI). The mostly used threshold for analysis is to consider a household that provides less or does not meet up to 80% of the caloric requirements as food insecure for the period under study (Zucula *et al.,* 1992; Haddad *et al.,* 1994).

2.2.2 Determinants of household food security

Households' food security status is determined mainly by socio-economic characteristics of the household aside natural happenings and political instability. Natural disasters such as drought, earthquake, flood, bush fire as well as political instability resulting in conflict, civil war and migration are likely to cause food insecurity. Oni *et al.,* (2011) noted that "poverty is the common cause of food insecurity and food insecurity is the major contributing factor to perpetuating of poverty". Hence, poverty and food security are intertwined in the same negative category; therefore, anything that affects income of household can affect its food security status (Oni *et al.*, 2011).

Babatunde *et al.* (2007) and Oluyole *et al.* (2009) looked at the socio-economic behaviours of households in their analysis of poverty and food insecurity. Some variables considered are number of members in household (household size) and structure, level of education of household head, value of agricultural and non-agricultural assets, food crops production, access to institutions and services and amount generated from off-farm activities (Datt and Jolliffe, 1999; Datt *et al.*, 2000; Geda *et al.,* 2001; Adenegan and Adewusi, 2007; Gebre, 2012). Others considered sex of household head in their analysis (Kakwani, 1993; Okojie, 2002; Arene and Anyaeji, 2010; Aidoo *et al.*, 2013).

2.3 Food Security and Cocoa Production

Cocoa production is seen as the back bone of the country's economy (Osei, 2007). It is popularly acclaimed that "Cocoa is Ghana; Ghana is Cocoa" because cocoa is regarded as the most important export crop which contributes about 8.2 percent to GDP of the Ghana. It also contributed over 30 percent of the entire export foreign earnings in 2010 (FAO, 2013).

Food security and cocoa production is noted to have a direct relation and connection in that good cocoa cultivation brings about crop diversification and the integration of other food crops, especially plantain, cassava, yam and some vegetable crops in constant association. The effective management of these associations is greatly profitable on a per hectare basis hence aiding in household food availability and contributing immensely to a better environmental stewardship (Osei-Bonsu *et al.,* 1996)

Problems of the incidence of food security have been fairly studied in the cocoa production regions in Ghana. Even though several successes have been recorded in the cocoa sub-sector in Ghana, yet some challenges still persist and also impede the progress of the sector (Mohammed *et al.,* 2011).

Ojo (2005) states that "cocoa farmers do not have well established farming system combining food crops in particular with cocoa cultivation". This is because, the shade provided by the cocoa plants after the early stages do not permit the food crops beneath to thrive.

"There is suggestive evidence to support the idea that high land prices challenge the extensive expansion and growth of cocoa farms in the Ashanti and Brong Ahafo regions of Ghana" (Teal *et al.,* 2006)

2.3.1 Food insecurity

There is a misconception about the terminology 'food insecurity' being "government's definition of hunger" but it is a wider term which explains entirely issues related with hunger

and the coping strategies used in mitigating its negative effects by households, all aimed at alleviating hunger and poverty. Food insecurity is broadly a household problem, not an individualistic one. The adverse effects of food insecurity have an impact on every member in a household and it affects them separately but some members (children) may be protected from this by household heads (mother or father). Again, it must be noted that 'food insecurity' does not necessarily imply lack of access to supermarkets, grocery shops or households do not have time to buy food stuffs or prepare them to consume but it simply refers to the absence of sufficient access to food depending on the economic and other resource endowment of the household.

Some researchers (Cudjoe, 2011) have established the linkage between self-sufficiency and food security, which implies a country's production of food should be enough to meet the demand of its population but largely, 'national food security' measures the ability of a country to make available and accessible food produce to meet the consumption demand of its citizens regardless of the source, whether locally produced or imported from a foreign market (Pinstrup-Andersen, 2009).

It is reported by Quaye (2008) that most farming households face some degree of food insecurity with its duration ranging between 3 and 7 months. Food insecurity is caused by several elements, some of which are multidimensional.

2.3.2 Causes of Food Insecurity

Generally, the prevalence of drought and conflict has been the main cause of aggravated problems of production of food, access and distribution. Issues of high population growth rates and prevalence of poverty have contributed a great deal to the problems of food insecurity. A research conducted by Arimah (2004) indicates that, the primary cause of food insecurity in most third world countries is the high rate of illitracy among its population. This is because

poverty has become widespread in the African continent and has made difficult attempts at eradicating food insecurity (Arimah, 2004).

One of the challenges of most sub-Saharan African families is meeting the food needs of members of the household and this challenge possess great difficulty to governments in the region at addressing issues of food insecurity. Again, these challenges come about as a result of prevalent causes of poverty such as changing trends of a country's economy, illiteracy, epidemic diseases, environmental problems, over population and civil unrests (Oldewage-Theron *et al.,* 2006).

Conflicts, high foreign debts, political insurrection and rapid rise in diseases, inconsistent weather patterns, degradation and deforestation, low agricultural productivity leading to hikes in food prices are all part of the causes of food insecurity in countries especially the developing ones (Rosenzweig *et al.*, 2001; Baro and Deubel, 2006).

2.3.3 Vulnerable groups to food insecurity

Though it is crucial to know the percentage of undernourished population to enable us observe the trends and assess the progress or otherwise of their food insecurity condition; just knowing the percentage of food insecure population is not enough for policy formulation. Therefore, it requires a comprehensive approach to know, who, when and where the food insecure populations are located. Food insecurity is a broad-based concept that cuts across borders; however, some communities or households are better placed to manage the effects of food insecurity than others. Vulnerability to food insecurity can be assessed on national, regional and household levels but higher food prices has been observed to be one of the major contributing factors to food insecurity in most households (Wodon *et al.*, 2008).

The most affected groups by higher food prices at household's level are the rural folks without arable lands, households headed by women and the poor people living in urban areas (Bokeloh

et al., 2009), also children, breast-feeding mothers and pregnant women (FAO, 2008; UNICEF, 2009). Their situation is considered as peculiar due to the fact that they already have less variety to consume from, and most often don't have enough strength to cope when there is food shortage (Bokeloh *et al.,* 2009). Brinkman *et al.,* (2010) noted that poor families in developing countries spend higher portions of their income (ranging from 50 to 80 percent) on food.

Although the rural poor are said to be in the majority in terms of food insecurity (World Bank, 2008) but the severity of the problem may be experienced by the urban poor (Jrad *et al.,* 2010). The urban poor experience severe form of food insecurity due to the fact that lower export demand and reduced Foreign Direct Investment (FDI) may increase unemployment in the urban zones, which are more linked to international markets than the rural zones (Bokeloh *et al.,* 2009). Baker (2008) further stressed that the urban poor are more vulnerable to soaring prices of food since they do not have in storage excess food to feed themselves in times of food shortages.

Though the urban poor are more affected by surges in world food prices, the effects can spill over to the rural poor due to reduction in remittances to the rural folk (Bokeloh *et al.,* 2009). "The increasing unemployment in the urban areas could have negative effects in rural areas since people may move from urban areas to rural areas, forcing the rural poor to share the burden in many cases" (Bokeloh *et al.,* 2009).

2.3.4 Livelihood activities to address food insecurity

One must find means by which to survive when faced with problems of food shortage or non-availability. Coping or survival strategies are measures adopted by families or households to mitigate the impact of food insecurity. Holmes *et al.,* (2009) reported that, "coping strategies adopted differ from moderate (short-term reduction in quantity and quality of food) to extreme

strategies (such as distress migration or distress sales of assets)" Therefore, food insecurity coping strategies can be used to determine the level of food insecurity among households.

Kyaw (2009) noted that households adopt the coping strategies at the early stages of food insecurity and the methods mostly used include the migration of household members in search of jobs and or eating wild food as well as sale of non-productive assets. Common strategies used by households when there is food shortage as identified in literature include: consuming less favorite foods, limiting quantity of food consumed, borrowing of food from friends or relatives, borrowing money to buy food, maternal buffering (parents skipping meal to make available enough food to feed children), skipping meal and skipping eating for the whole day (Maxwell, 1996; Holmes *et al.*, 2009; Nyanteng and Asuming-Brempong, 2003; Quaye, 2008). Due to the difficulty in obtaining accurate and reliable data on income, expenditure and production as well as the high cost of data collection based on 24-hour recalls, some researchers resort to the use of coping mechanism (such as eating less preferred food, borrowing money from cocoa purchasing clerks etc.) in estimating the food insecurity level of households (Maxwell, 1996).

2.3.5 Trends of Food Security in cocoa growing areas in Ghana

The effects of climate warming could worsen the problems of food availability, accessibility and utilization in Ghana that have existed for decades (Cudjoe, 2011). Ghana was well-to-do in terms of food production prior to independence (Cudjoe, 2007) and after Ghana gained independence, the government at the time targeted the agricultural potential and wealth of the nation to embark on economic development programme. This saw to the establishment of many processing plants for food and several silos across the country for storage in order to boost food production. As a result, there was improvement in food production and within the period, the percentage of food consumed against the total production was 79.5 percent in the 1960s and just 60.3 percent in the 2000s whilst 19 percent of the food produced was wasted

owing to the absence of storage, processing and transportation (22.7 percent in the 2000s) (Cudjoe, 2007).

To further boost and stabilize the food security situation in the country, the government embarked on institutional reforms aimed at technically supporting and offering credit facilities to small-holder farmers by setting up the Agricultural Development Bank (ADB). However, due to the fall in prices of commodities in late 1960s coupled with general weakening of essential infrastructure and services, many farmers were challenged with little motivation to produce due to reduction in their purchasing power (Cudjoe, 2011).

In the dying ambers of 1982 the country was gravely affected by famine and by 1983 there was serious food shortage where people depended on all sorts of things for survival. Some of the foods consumed in those times were water leafs, cocoyam comb and even unripe bananas (used in place of plantain) which would not be consumed by people on a regular day or even classified as food stuff of the country under normal circumstances.

Analysis of the regional poverty between 1998 and 1999 revealed that the three northern regions (Upper East, Upper West and Northern) dominated the poverty chart with Upper East Region being the poorest region in the country while Greater Accra Region recorded the lowest incidence of poverty (GSS, 2000). The remaining regions lie between the two extremes and Central Region was one of the regions considered poorest in the southern part of Ghana between 1998 and 1999 where inhabitants struggled to meet the nutritional requirement (GSS, 2000).

According to Al-hassan *et al.*, (2004) the estimated post-harvest losses for maize and other cereals stood at 14 percent and 8 percent, respectively. Due to lack of proper storage facilities, farmers continue to store their farm produce in traditional structures whose effectiveness cannot be guaranteed. Nyanteng and Dapaah (1993) estimated that transportation contributed

about 70 percent of food marketing costs in the country in the early 1990s. The transportation cost is eventually passed on to customers affecting their food consumption basket thereby reducing their food availability, accessibility and utilization.

It is worth noting that several reported cases of food security problems in the country have become more of a cyclical one and for that matter it is recorded in all parts of the country. The most vulnerable and deprived zone which is greatly affected by food insecurity is the Upper East Region (GSS, 2014). The population of the country was estimated to be 24,658,825 according to the population and housing census in 2010 (GSS, 2012) and its currently projected to be 28,308,301 in September, 2016 (GSS, 2016). This implies that the demand for food will increase to match up the population growth, hence required accelerated agricultural growth.

Ironically, agricultural production growth in Ghana is rather not stable. The Agriculture sector of Ghana has experienced unstable growth rates from 2010 to 2015. The sector reduced growth rate from 5.3 to 0.8 percent from 2010 to 2011, it then increased from 0.8 to 2.3 percent from 2011 to 2012. From 2012 to 2013, the Agricultural sector again saw some growth from 2.3 to 5.7 percent. The sector declined in growth from 5.7 to 4.6 percent in 2014 and further declined to 0.0 percent in 2015 (GSS, 2015).

Most areas in the sector of Agriculture have also recorded substantive declination in growth (crops and fishing sub-sector) with the exception of the livestock sub-sector which has seen some marginal growth. The key sub-sector which controls food security (Crops) reduced in growth from 2013 to 2014 (5.9 to 5.7 percent), it further reduced from 2014 to 2015 (5.7 to -1.7 percent). This trend indicates a steady reduction in growth for three consecutive years (GSS, 2015).

2.3.6 Food security situation in the Ashanti Region of Ghana

According to Narayan *et al.,* (2000), "hunger is the bottom-line of poverty, and food is central to poor people's concerns", hence the poverty level of households is the reflection of their food insecurity status. In a report filed by the World Food Programme (2012) it was found out that in the Upper West, Upper East and Northern Regions of Ghana, more than 680,000 people were considered to be either severely or moderately food insecure at the time of the survey. Of the food insecure, 140,000 are classified as severely food insecure, having a very poor diet consisting of just staple foods, some vegetables and oil, and little else. The Upper East Region has the highest proportion of households who are either severely or moderately food insecure (28%). In the Northern and Upper West regions 10% and 16% of households respectively are either severely or moderately food insecure. The five districts with the highest proportion of households who are either severely or moderately food insecure are Wa West (42%), Central Gonja (39%), Talensi-Nabdam (39%), Kassena-Nankana West (35%) and Kassena-Nankana East (33%).

Apart from the highest incidence of food insecurity recorded in the three northern regions of Ghana about 1.5 million people who are very susceptible to food insecurity could be found in the other remaining regions. Brong Ahafo Region has the highest share of these people (11%) followed by Ashanti Region with 10%, Eastern Region (8%) and the Volta Region (7%).

Ashanti Region was the third most urbanized region in 1960, as of 1970, the region had risen to be the second most urbanized in Ghana and within the period of 1960 and 2000, the urban population of the region increased more than two folds reaching 53.2 percent, a sign of rapid urban population growth in the region (Frimpong, 2013). This therefore possesses a contemporary threat on the food security of the region since more and more people are feeding from the less productive farms in the region cultivated by farmers.

According to Frimpong (2013), the urban households in the Ashanti Region are on average deficient in calories hence food insecure. From the study 78.5% of the respondents were food insecure. This means that on average 78.5% of urban households respectively are not able to meet the stipulated minimum calorie requirement.

In the study "Comparative Study of Determinants of Food Security in Rural and Urban Households of Ashanti Region , Ghana" by Frimpong and Asumming-Brempong (2013), it was found out that the food security status of rural households is better than those in urban households. This was largely due to the readily available and quality food produce cultivated by the rural dwellers who are mostly crop farmers. The situation of cocoa farmers in the region is however not clear since they are not classified as food crop farmers even though they do grow some food crops on subsistence basis for their livelihoods. Again the food security situation of cocoa farmers in the Ashanti region cannot be clearly defined as there has not been an extensive research work done so far to ascertain this.

2.3.7 Government interventions and effects on food security

The agricultural sector in Ghana has received several interventions from governments in the past. These interventions were aimed at improving yield, reducing poverty, increasing income and improving food security status of farmers (Norton, 2004 and ISSER, 2008). Among the interventions include the distribution of genetically improved varieties of crops and the provision of technical support and other modern technologies to farmers (Jatoe, 2000; Al-hassan *et al.*, 2004; Langyintuo and Dogbe, 2005).

The government through MOFA is also deploying several interventions aimed at ensuring increase in the productivity and growth rate of the agricultural sector. Among the recent interventions include agricultural policies to increase the production of the major staples (maize, cassava, rice, yam and cowpea) through the provision of chemical input (fertilizer) subsidy which enables farmers especially the small-holder ones to also have access to fertilizer

at subsidized prices (MOFA, 2014) and also supplies of livestock and poultry to carefully chosen farmers to help as out-growers to other farmers. However, according to Akudugu *et al.*, (2009), the fertilizer subsidy did not benefit the intended poor or small holder farmers and women who cannot afford and have limited access to productive resources.

Another major challenge facing the fertilizer subsidy is the smuggling of the fertilizer to neighboring countries to sell for profit by individuals thereby depriving farmers of the benefit of the government intervention.

Specific projects of government like rural irrigation, electrification and rehabilitation of existing infrastructure impacts the lives of rural dwellers (mostly farmers) positively through enhanced productivity which leads to bettering their food security status. In Al-Hassan *et al.*, (2004), it was established that majority of farmers who benefit from irrigation projects were of the view that access to irrigation for year round farming contributes significantly to reducing food insecurity.

2.4 Empirical Studies on Coping Strategies for Food Security

The study conducted by Orewa and Iyangbe (2010b) to assess the coping strategies used to fight against food insecurity by families in Endo State, Nigeria employed 48 hours' food consumption recall to estimate food security status using a modified version of Foster, Greer and Thorbecke (FGT) Poverty Index developed by Foster *et al.*, (1984). This *FGT* index was later modified by Aromalaran (1999 and 2000) and used by Appleton (1999) to form the basis for measuring the food security status of households. The modified index is given by the general formula:

$$F_{\alpha=\frac{1}{N}} \sum_{i=1}^{p} ((F_L - C_i) \div F_L)\alpha$$

Where F_α or Food security index (FSI) is a measure of the level of food insecurity. From the equation, when $\alpha = 0$, it calculates the occurrence of food insecurity and when $\alpha = 1$, it calculates the depth of food insecurity and when $\alpha = 2$, it also calculates the severity of food insecurity. "α" is a measure of inequality aversion. P = Number of individuals within a household whose calorie intake fall below the minimum recommended level. N = Number of individuals in a household, F_L = Food security line, which is the lowest required level of calorie intake for an individual. C_i = the level of caloric intake individual members of a household. When $\alpha = 0$, the formula becomes $FO = P \div N$.

The result of the study conducted by Orewa and Iyanbge (2010a) revealed that the depth of food insecurity among the rural dwellers was higher than the urban dwellers but severity of food insecurity was higher among the urban communities. The result further indicated that between 19 percent and 24 percent increase in daily calorie intake are required by the low income urban and rural households respectively to meet the recommended daily allowance (RDA). In identifying the prevailing food insecurity coping strategies, they adopted the ranking score method. From the study, the most commonly practiced coping strategy was the purchasing of less favorite food which is also in line with the findings of Maxwell (1996).

In Ojogho (2010), when he sought to estimate the determinants of food insecurity among arable farming households in Edo State, Nigeria, data collected were subjected to both descriptive and inferential statistics such as Greer-Thorbecke Index of food insecurity and multivariate logit regression. A separate food insecurity line was defined for the area; to achieve this, a regression of the Cost-of-Calorie (CoC) of food consumed by each household on the calorie equivalent as proposed by Foster et al. (1986) was used. The result of this study showed that 41 - 50 years age group had 13.10, 2.90 and 0.86% as headcount index, short fall index and severity of food insecurity while the households with male as head had 21.62, 5.62 and 1.91% as headcount index, short fall index and severity of food insecurity, respectively. At the mean

values of determinants of food insecurity in the study the probability of a household being food insecure was 0.997 (99.7%). This concludes that the households in the study area are food secure.

Demi and Kurwornu (2013) conducted a research work in assessing the degree of food insecurity among farming households in the Central Region of Ghana and found out that most of the respondents (67.9 %) in the study area were food insecure whilst only 32.1% of them were food secure which consequently implied that farming households in the study area were predominantly suffering from food insecurity. In their findings, the mean FSI for the food secure households was 1.4 (above the threshold of 1) and that for food insecure households was 0.67 (below the threshold of 1). Again, the per capita caloric intake of the sample households was estimated to be 2121kcal, this falls short by 728kcal as against the national average of 2,849kcal.

The above enumerated indices computed by Demi and Kuwornu (2013) were greater than the indices computed by Pappoe (2011) and Quainoo (2010) in a similar study done in same study area (Central Region of Ghana). That notwithstanding, in the analysis of Pappoe (2011) he made use of three staple foods (maize, rice and cassava) and used respondents from the coastal area.

Furthermore, Demi and Kuwornu (2013) found out that food insecurity gap (FIG) which measures the gravity of the food insecurity of households is also estimated to be 0.26 which implies food insecure households required an additional 26% of calorie intake to meet their daily calorie requirements. This was achieved by computing an index based on coping strategies obtained from reviewing literature.

In establishing the food security status of the households, FSI (Z_i) was constructed and the food security status of households in the study area were arrived at based on the line of food security

adopting the Recommended Daily Caloric Intake (RDCI) approach as seen in Babatunde *et al.*, (2007). In concluding, farming households whose Daily Caloric Intake (DCI) were equal or greater than the RDCI were categorized as food secure and on the other hand farming households whose DCI fall below the RDCI were grouped food insecure households. In their analysis the FSI was given as:

$$Z_i = \frac{Y_i}{R}$$

In the above expression, Z_i = FSI of a given household (i^{th}), Y_i = the specific DCI of a given household and R = RDCI of given household. In estimating the per capita DCI; the actual amount of calories consumed daily by each household was divided by the number of members in that particular household. The Per capita Daily Calorie Requirement (PDCR) of each household was also estimated by dividing the Daily Calorie Requirement (DCR) of the household by the number of members of the household. With the FSI calculated, the Food Insecurity Gap (FIG) of the households was further estimated and given as;

$$\frac{1}{M}\sum_{i=1}^{n} G_i$$

where M = the number of households which are food insecure and G_i = the caloric intake deficit for a given household (i^{th}). G_i could be further expressed as;

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

The previous definitions of Y_i and R still hold.

The study used the Recommended Daily Caloric Intake (RDCI) of each farming household in the study area recommended by GSS and IFPRI (2000) which is 2,900kcal.

2.5 Conclusion of Literature Review

It can therefore be concluded that, the concept of food security covers a very wide scope and areas which can be studied at various levels and dimensions. Several factors are responsible for food security or insecurity but the leading cause of food insecurity is poverty (Oni *et al.,* 2011).

Several attempts have been made at researching into food security and other related issues in the Ashanti Region of Ghana but there is still a gap to be bridged in that regard with respect to inquiring into the food security status of cocoa farming households. This is largely because cocoa farmers in the country especially coming from one of the highest cocoa producing regions are deemed to be well to do and for that matter issues of food insecurity are not associated with them.

Several attempts have been made by researchers at measuring household food security including the Food Security Index (FSI) used by Babatunde *et al.,* (2007) and Khatri-Chhetri and Maharjan (2006) and the Cost-of-Calorie (CoC) approach as used by Oluyole *et al.* (2009) and Ojogho (2010). However, the use of Cost-of-Calorie approach may introduce some bias since this approach measures what households have spent on food which may not necessary equal what they actually consumed.

The literature also contains several statistical models for assessing the determinants of household food security status. Notable in list of these models are the Tobit model used by Etim and Patrick (2010) and Frimpong and Asuming-Brempong (2013), the Probit model as used by Oluyole *et al.*, 2009 and Aidoo *et al.*, 2013, and Logit model (Babatunde *et al.*, 2007; Gebre, 2012; Demi and Kuwornu, 2013; Abubakari and Abubakari, 2015).

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework

This study is centered on the theory of consumer demand and production analysis proposed by Singh *et al.*, (1986). The theory and models of household food security in the context of consumer demand and production using Agricultural Household Models (AHM) was considered for this studies. In these models, agricultural household assumes a status of both consumers and producers. Based on the hypothesis of 'seperability' of production and consumption decisions, the AHMs set household's independent production choices (separate of consumption preferences) and then it resolves the consumption choices (on the premise of optimal production choices). A function of the household utility is hence expressed as:

$$U = U\,(F_i\,,\, F_m\,,\, l\,;\, D_h) \tag{3.1}$$

where U = utility function which is taken to be very stable, F_i = vector of household made goods used by themselves, F_m = vector of goods purchased on the market consumed by household, l = leisure as seen in Faridi and Wadood (2010) and D_h = household characteristics (Demographic characteristics). Households assume the status of producers and consumers, hence, efficiently maximize utility from consuming the goods and services which is relative to the farm production, income generated and time constraint. This is given as;

$$G\,(Q_i, L, A^0, K^0) = 0 \tag{3.2}$$

$$P_i\,(Q_i - F_i) - P_m F_m - w(L - L_f) + N = 0 \tag{3.3}$$

$$T = L_f + I \tag{3.4}$$

"where G is an implicit production function that is assumed to be well-behaved (twice differentiable, increasing in outputs, decreasing in inputs and strictly convex); Q_i is a vector of

quantities of goods produced on-farm; L is total labour input to the farm; A^0 is the household's fixed quantity of land; K^0 is the fixed stock of capital; P_i is the price of good i; P_m is the price of market-purchased good; $(Q_i - F_i)$ is the marketed surplus of good i; w is the wage rate; L_f is the household labour supply for on-farm use; N represents non-farm income that adjusts to ensure that equation 3.3 equals to zero; T is the total time available for the household to allocate between work and leisure" (Babatunde *et al.*, 2007).

Based on the assumption of 'seperability', we can proceed to solve first the production side. The first-order situations for input demand (L^*) and output supply (Q^*) in relation to prices, rates of wages, constant land and capital. This is expressed as follows;

$$L^* = L^* (P_i, w, A^0, K^0) \quad \text{and} \tag{3.5}$$

$$Q^* = Q^* (P_i, w, A^0, K^0) \tag{3.6}$$

Equations (3.3) and (3.4) may be rearranged and L^* and Q^* factored into the new equation, to obtain;

$$E^* = P_i Q_i^* + wT - wL^* + N \tag{3.7}$$

$$E^* = wT + \pi^* (P_i, w, A^0, K^0) + N \tag{3.8}$$

In the above E^* = maximum income under the consideration of maximized profit (π^*).

At this point, the first-order condition for 'consumption demand' can then be solved with respect to prices, wage rate and income as follows;

$$F_k = F_k (P_i, P_m, w, E^*) \tag{3.9}$$

Making the constant $k = i, m$. When household demographics (D_h) is factored in the equation, food demand can be written as;

$$F_k = F_k [P_i, P_m, w, E^* (w, A^0 K^0) D_h] \tag{3.10}$$

Once the demand for both home-made and market-acquired food is determined 'Food-Calorie Conversion Table' can be used to estimate the sum amount of calories (Y_i) contained in all food stuffs available to households. As Babatunde *et al.*, (2007) state the food security index of a given household can be estimated as;

$$Z_i = \frac{Y_i}{R_i} \tag{3.11}$$

where Z_i = food security index of a given household (i^{th}), Y_i = actual daily calorie intake of a given household and R_i = the recommended daily calorie intake of a given household. The decision rule is that, if $\boldsymbol{Z_i \geq 1}$, then the household is considered food secure and if $\boldsymbol{Z_i < 1}$, then the household is considered food insecure. Assuming a linear function as used by Feleke *et al.*, (2005), food security equation can be written as:

$$Z_i = \sum_{j=1}^{n=k} \beta_i X_i + \varepsilon_i \tag{3.12}$$

In equations (3.11) and (3.12), the dependent variable Z_i is a discrete variable. This model is a qualitative response one where Z_i is the probability that a household is food secure, such that;

$$Z_i = \Pr ob(Z_i = 1) = \Pr ob(\sum \beta_i X_i + \varepsilon_i > 0) \tag{3.13}$$

Therefore, Logit regression models can be used and estimated as:

$$Ln(\frac{Z_i}{1-Z_i}) = \beta_0 + \sum_{j=1}^{n=k} \beta_i X_i + \varepsilon_i \tag{3.14}$$

where Z_i = conditional likelihood of food security (probability), β_i's = coefficients to be estimated and X_i's = explanatory variables.

3.2 Conceptual Framework

Figure 3.1 uses a bottom-up approach to explain the elements and determinants of cocoa producing households' food security status. The study considers household as a group of individuals who share similar economic activities which is essential for the household's survival and the comfort of its members (Rudie, 1995) and more importantly eat from a common pot. From the diagram, each household has resource endowment which could be natural (land, vegetation), physical (cash, tools, machinery) and human (labour, skill, education, human resource of institutions and organisations). Households engaged in cocoa farming in this scenario assume the position of both producers and consumers and make a decision to exchange their first resource entitlement to acquire food and money through resource allocation and utilization.

This decision is influenced by the physical surrounding (environment), social environment (people and the community), cultural principles of the community (traditions and norms) and the economic policies provided by the government and private institutions in the country. The relationship between a cocoa farming household's resource endowments, productions and the decision factors decide the livelihood strategies or income generating activities that a specific household adopts.

Cocoa farming household members who are predominantly in the rural areas engage in either natural resource based activities like farming (food crop, livestock production) or forest resource use (non-farm but on-farm like charcoal production) and non-natural resource based activities which are referred to as off-farm activities (e.g. construction works, professional jobs etc.). When households adopt natural resource based strategy, it leads to production of food or non-food items which in turn leads to consumption or generation of income. But when households adopt non-natural resource-based activities, it leads to generation of income through provision of services, sale of non-agricultural produce or materials owned. The income

from the sale of food items, non-food or non-agricultural production as well as the resource owned by households can be used to purchase food to supplement households own food production. The total of own food production and purchased food makes up the total consumption of households. These strategies coupled with improved production through increased availability and use of inputs (resources) ensures sufficient food availability whilst increased and stable income streams (through sales, adequate markets for exchange and wages) ensures adequate access to food (food accessibility).

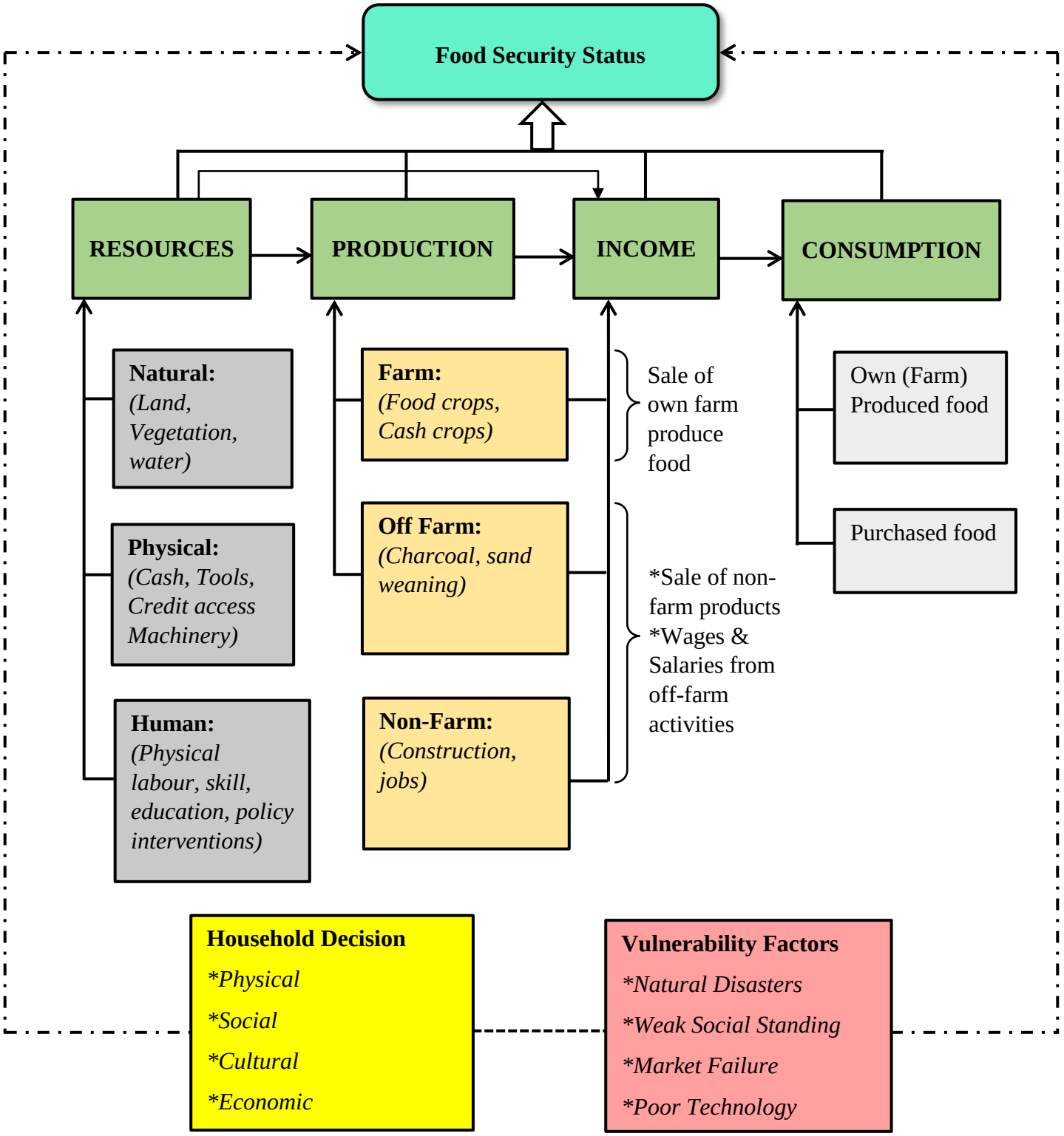
The factor of vulnerability is associated with risk and other related issues. Risk is a situation where the probability of occurring is known. Therefore, the danger of food deficit can be considered as a probability of a household failing to attain a specific threshold of comfort and well-being in the foreseeable future (Christiaensen and Boisvert, 2000). Hence, susceptibility to food insecurity shows a likelihood of failure to meet the mark of the nutritional requisite for healthy living in the future. At the level of the rural cocoa farming household, four broad risk factors were identified, these are natural conditions (drought/water scarcity, flood, land degradation), weak social standing (loss of off-farm jobs, indebtedness, low level of education) and poor technology adoption (obsolete cultural practices such as slash and burn, use of manual farm tools, inappropriate storage facilities, lack of social alignment (cooperatives).

There is a causal relationship existing between the elements in the diagram which leads to a household's food security status. A household's resource endowment is at the core of its ability to produce or acquire the enough income to provide the basic food commodities for subsistence hence 'Resources' is seen to be having a direct link with 'Production' and an overlapping relationship with 'Income'. This is because one's ability to engage in any farming activity (production) is mainly on the availability of land (resource). Again, land or other resources can be sold for money (income) which is largely used in purchasing household food for consumption. Production and income on the other hand result in consumption as produce

harvested from household's farm would be prepared for consumption in order to satisfy their dietary needs. Income can be generated from the sale of these food crops/produce to acquire preferred food commodities for consumption. It is also worth noting that the level of consumption of the households ultimately results in their food security status, hence those who are able to meet their dietary requirements as a result of having the needed resources, adequate food production or required income to purchase food for consumption stand a better chance of attaining food security.

The conceptual framework shows that food insecurity affects poor household with fewer resource endowment, weak social status, weak policies of transforming structures and lack of participation in social groups (such as cooperatives and fun clubs).

3.1 Conceptual Framework of the Analysis of Food Security Status



Source: Modified version of Nyariki and Wiggins (1997); Conceptual framework of household food security elements.

3.3 Analysis of Specific Objectives

This section seeks to throw more light on the means by which the various specific objectives were attained.

3.3.1 Determining the Food Security Status of Cocoa Farming Households

To establish the food security status of cocoa farming households in the study area, the study constructed a Food Security Index (*FSI*) which is represented by (Z_i) and determined the food security status of each household using the recommended daily calorie approach as suggested by Babatunde *et al.*, (2007), Bogale and Shimelis (2009) and Demi and Kuwornu (2013). Households whose daily calorie intake were equal or higher than the recommended daily calorie required were considered food secure and those whose daily calorie intake were below the recommended daily calorie required were considered food insecure. The FSI was estimated using equation (3.12).

To obtain per capita daily calorie intake, the daily calorie intake (weekly calorie intake divided by the number of days in the week) from each household was divided by its' household size which was the number of people who lives with the household head and depend on him or her for their livelihood. 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 estimated other indices such as Food Insecurity Gap (FIG_i), square food insecurity ($SFIG_i$) headcount ratio (*HCR*) and Surplus Index (*SI*). The mean FIG_i is given by:

$$FIG_i = \frac{1}{M}\sum_{i=1}^{n} G_i \qquad (3.15)$$

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

$$G_i = (\frac{Y_i - R}{R}) \tag{3.16}$$

Mean Square Food Insecurity Gap ($SFIG_i$) is defined as:

$$SFIG_i = (\frac{1}{M}\sum_1^n G_i)^2 \tag{3.17}$$

The Headcount Ratio (*HCR*) is defined as:

$$HCR = \frac{M}{N} \times 100\% \tag{3.18}$$

where *N* represents the number of households in the sample.

The mean Surplus Index (*SI*) is given by:

$$SI = \frac{1}{M}\sum_1^n (\frac{R - Y_i}{R}) \tag{3.19}$$

The GSS and IFPRI (2000) as well as FAO (Ghana) standards were used as the recommended calorie requirement per adult (See Table 3.1). Though the literature is silent on which standard is the best, the most widely used by researchers are the ones mentioned above. This informed the choice of those standards.

Table 3.1 Recommended Dietary Allowance (RDA) or Food Needs Per Adult

Organization	**100% RDA**	**80% RDA**
FAO (Ghana)	2,260 Kcal	1,808 Kcal
GSS and IFPRI (2000)	2,900 Kcal	2,320 Kcal

Source: Demi and Kuwornu (2013)

The cocoa farming household's daily requirement (daily calorie requirement) was estimated by categorizing members of each household into different age groups based on the fact that different age groups have different calorie requirements. Though certain categories of

individuals have different requirements from adult requirement, no such requirements have been developed in Ghana (GSS, 2000). Hence, the requirement used for most food security studies in Ghana (Pappoe, 2011; Quainoo 2010; Demi and Kuwornu, 2013) was employed. The daily energy (calorie) requirements of the various compositions of the households were converted into adult equivalent using the scales as shown in table 3.2.

Table 3.2 Recommended Daily Energy Intake and Equivalent Scale

Age Category (years)	Average energy allowance per day	Adult equivalent scale
Children (below 6)	1150	0.4
Children (6 – 18)	2250	0.7
Adults (above 18)	2900	1.0

Source: GSS, 2000.

Total calorie requirement per household was obtained by multiplying the total of adult equivalence in each households by the recommended calorie requirement of 2,900 Kcal (i.e. total number of adult equivalent multiplied by 2,900 Kcal). The total food requirements for children were converted to the adult equivalent. This was done by multiplying the total number of children below the age of six (6) years in each household by the adult equivalent and the recommended daily calorie requirement of 2,900 Kcal.

The total number of children from the age of 6 to 18 years in each household was multiplied by a recommended daily calorie requirement of 2,900 Kcal and a conversion factor of 0.7 to arrive at their adult equivalent requirement. The total daily calorie requirement for each household was obtained by summing up the requirements for the three age groups estimated for each household. The procedure was then repeated for recommended daily calorie requirement of 2,260 Kcal (FAO Ghana).

Households' daily food consumption (daily calorie intake) was obtained from households own food production, food purchases in supplementing own food production, food given to others as gifts and some times where possible food received as gift by the households from others. The data on actual staple food consumed (cassava, rice, maize, yam, plantain), fruits, vegetables (vitamins) and meat/fish (protein) by each household per week was obtained (Appendix 7) and converted into kilogram (kg). The energy content of 1kg of each food item (cassava, rice, maize, plantain, mixed vegetables, mixed fruits and meat/fish) was gotten from literature as illustrated below in table 3.3.

Table 3.3 Calorie Equivalent Conversion Ratios of Major Staple Food Items

Food crop	Calorie/Kg (Kcal)	Milling Ratio
Maize	3,590	0.85
Rice	3,640	0.65
Cassava	1,490	0.90
Plantain	1,350	0.87
Yam	1,190	-
Vegetables (Mixed)	110	-
Fruits (Mixed)	690	-
Meat/Fish	3,870	-

Source: Okigbo (1991) [Compiled by Tayie and Lartey (2008).]

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 multiplied by 1,490 Kcal = Total Kcal of cassava consumed). The same procedure was repeated for all other commodities consumed by the household. However, due to the processing and milling 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, rice, cassava and plantain consumed by each

household were summed up and divided by 7 to obtain actual daily calorie intake per household and compared with the requirement of the household estimated.

3.3.2 Models for estimating the determinants of Food Security status of cocoa farming households

Estimating the determinants of household food security status could be done using different models. That notwithstanding, linear regression analysis is conventionally used by most researchers in social and economic research works for the reason being the easy availability of simple statistical software packages as well as the ease with which the results are interpreted (Bogale and Shimelis, 2009). However, it is important to note that the results derived from linear regression could lead to unreasonable estimates when dependent variable is binary (Bogale and Shimelis, 2009) for that reason the logit and probit models are preferred as means to address the shortfalls of the linear regression model (Gujarati, 2003).

The choice between these two estimating techniques (logit and probit) depends on the researcher since both models yield similar results. However, the only difference between logit and probit models is that the Logistic distribution has slightly fatter tails (Bogale and Shimelis, 2009), therefore, there is no compelling reason to choose one over the other. That notwithstanding, due to its comparative mathematical and interpretational convenience several researchers tend to choose the Logit model (Hosmer and Lemeshew, 1989). Following Babatunde *et al.,* (2007), Bogale and Shimelis (2009), Pappoe (2011), Demi and Kuwornu (2013), the study employed the Logit regression model to estimate determinants of food security status of the cocoa farming households in the study area.

Measurement of Variables

The dependent variable (food security status) is a binary variable which takes a value of one (1) for 'food secure' cocoa farming household and zero (0) for 'food insecure' cocoa farming household. The cumulative logistic model was specified by Pindyck and Rubinfeld (1981) as:

$$P_i = F(Z_i) = \frac{1}{1+e^{-(\alpha+\sum\beta_i X_i)}} \quad (3.20)$$

where P_i is the probability that an individual is food secure given X_i, where,

X_i represents the i^{th} explanatory variables, α and β_i are regression parameters to be estimated and e is the base of the natural logarithm.

For convenient and easy explanation of the coefficients, a logit model could be written in terms of log odds ratio. Log odds ratio is the probability of a household not to be food insecure (1-P_i). That is $\frac{P_i}{1-P_i} = e^{Z_i}$

Taking the natural logarithm of the equation yields:

$$\ln(\frac{P_i}{1-P_i}) = Z_i = \alpha + \beta_i x_i + \beta_2 x_2 ... + \beta_k \beta_k \quad (3.21)$$

If the error term (ε_i) is taken into consideration, the logit model then becomes:

$$Z_i = \alpha + \sum_{i-1}^{n} \beta_i x_i + \varepsilon_i \quad (3.22)$$

where Z_i is the food security status of i^{th} household (1 = food secure household and 0 = food insecure household). α and β_i are the regression parameters to be estimated, X_i is a vector of explanatory variables and ε_i is the error term which assumes normal distribution.

Factors influencing Food Security Status of the Cocoa Farming Households

The specific model for this study is specified as:

$$Z_i = \alpha_0 + \beta_1 AHH + \beta_2 EDU + \beta_3 HHS + \beta_4 DEP + \beta_5 ACT + \beta_6 ACC + \beta_7 OFP + \beta_8 COI + \beta_9 OFE + \beta_{10} REM + \beta_{11} AWI + \beta_{12} AOW + \varepsilon$$

β_1, β_2, β_3 … and β_{12} are parameter estimates and that

$\beta_1, \beta_6, \beta_9 \neq 0$, $\beta_2, \beta_7, \beta_8, \beta_{10}, \beta_{11}, \beta_{12} > 0$ and $\beta_3, \beta_4, \beta_5 < 0$.

Justification for Selected Variables

1. **Age of household head:** The age of household head is expected to affect his or her labour supply for food production (Babatunde *et al.*, 2007). The young and energetic household heads (20 to 60 years) are expected to cultivate larger farm sizes compared to older and weak ones (above 60 years). It also determines the ability to seek and obtain off-farm jobs and income which younger household heads can do better. On the contrary, Arene and Anyaeji (2010) found that older household heads are more food secure than the younger ones due to their high level of experience in the farming activities. With these two empirical arguments it is expected that the effects of age of household head on food security could be either positive or negative.
2. **Educational status of household head:** One of the social capitals expected to build the human capacity is education and for that matter its effect on the household food security is positive. According to Shaikh (2007), educated individuals have capacity to process and apply information passed on to them. Lower educational status could impede access to better job opportunities in the labour market and obstruct more profitable entrepreneurship (FAO, 2012). A percentage increase in the proportion of GNP allocated to education reduces the proportion of a country's population living below the national poverty line by 2.54 percent (Arimah, 2004). Educated household heads (especially the females) are placed in a better position to understand the importance of nutrition and have the ability to

combine food ingredients for an active and a healthy life. Since education's impact on the lives of people is positive, in the same light it is expected to have positive effect on their food security status.

3. **Household population (adult equivalent):** This is total number of members in a household sharing common resources especially consuming from the same pot. The number of people in a household determines the quantity of food to be produced or procured for consumption hence the larger the number of people in a household the larger the quantity of food required to feed them. It must be noted that the food requirement of every household is dependent on the age category of the members, that is children below 6 years, 6 to 18 years and those above 18 years all have different quantity of food required to meet their calorific requirement. Therefore, the household size and the number of adult equivalent household is not the same and has a direct relationship with their food security status. While other have used the absolute number of household members in their study, this study uses the adult equivalent household number. This variable was found to have a negative relationship with the food security status of the households as the household number increases in Adenegan and Adewusi, (2007), Gebre (2012), Aidoo et. al. (2013) and Abubakari and Abubakari (2015). The a priori expectation of this variable is negative.
4. **Dependency ratio:** Dependents are the number of people who rely on the support of someone for existence or living. Dependency ratio is the total number of people in the household divided by the number of people working in that household to support daily provision of food for existence. According to Feleke *et al.,* (2003) scarce resources coupled with an increase in household size especially the non-working members put pressure on consumption than production. Ojogbo (2010) also found that, an increase in the number of non-working members of a household (that is dependent members increase relative to

working members) increases household food insecurity level. The predicted effect of this variable on food security status is negative.

5. **Age of cocoa trees:** The number of years a cocoa tree has stayed active on the farm usually affect its productivity, much younger or new trees are expected to yield more cocoa fruits than the older trees this is because yield increases gradually and then plateaus and then decline gradually thereafter. According to Jagoret *et al.,* (2007), the average yield of a cocoa tree decreases significantly over a period of two decades. Aging cocoa trees (above 35 years) coupled with problems of bad weather could result in poor yield (Agbongiarhuoyi *et al.*, 2013). Most cocoa farms in Ghana normally have more of the aged cocoa trees (from 20 to 80 years) which lower the total yield (productivity) of the farm and in a long run affects the income obtained (Agbongiarhuoyi *et al.,* 2013). The expected effect on food security is negative. The age of a cocoa tree takes in consideration the three phases of the tree's life that is seedling, flowing and harvesting.
6. **Access to credit:** This is the ability of the household head to secure credit/loans both in cash and kind either for consumption or to support farm production. Credit could come from various sources such as relatives, friends, NGOs, government, semi-formal organizations (susu), money lenders, banks and others. Access is not only when credits required are received fully but even partially. Consumption credit increases household's income in the short term and could increase the consumption basket of households (Babatunde *et al.,* 2007). Production credit on the other hand when obtained on time could increase chances of household to acquire productive resources (planting materials, fertilizers, insecticides, pesticides and others) which will boost production and improve food situation in the house. Credit when obtained by households can serve as a consumption smoothing mechanism in the event of food shortages (Zeller and Sharma, 2000). Access to credit is therefore defined as 1 = households that obtained credit in the

last cropping season and 0 = households that didn't obtain any of their required credit. The expected effect on food security is positive.

7. **Quantity of own food production:** This is the total quantity of food households produced from their own farms measured in kilogram and carcass weight equivalent for livestock. On the other hand, sales of household's own produced food is not factored here since they add up to their disposable incomes. The quantity of households' own food production increases the probability of being food secured (Quainoo, 2010; Pappoe, 2011). The expected effect of own food production on food security is positive.
8. **Income from cocoa farm:** This variable measures the total amount of money obtained in the sale of cocoa beans to the licensed buyers at the end of both the major and minor seasons. The amount of money obtained by cocoa farming households in the major season is higher than the amount received in the minor season because the volume of production in the major season is higher than the quantity obtained during the minor and also the quality of beans in the major is better than that of the minor season. Since the total earning from cocoa is not spent on food, this variable considers only the portion spent on food during the year. The income received from the main occupation (cocoa farming) has considerable influence on the food security status of the household. Higher income households are guaranteed by consistent supply of food whiles the opposite is true in the case of lower income households.

   Production of export crops like cocoa has a positive effect on household income, food security and nutrition of farmers (Owusu and Frimpong, 2014). The a priori expectation of this variable on the food security is positive when more of such money is spent on food.
9. **Off-farm earnings:** This variable looks at monies accrued from other engagements either than the main occupation of the farmers which is cocoa farming. Farmers in general sometimes engage in these off-farm activities to generate income to supplement that which

comes from their main farming activities which are not adequate to finance their household needs. The level of off-farm activity can affect household's food security but this can either be positive or negative depending on the level and earnings from that activity (Babatunde *et al.*, 2007). This is because engagement in off-farm activity can bring in money thereby enhancing 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 is not commensurate with the forgone farm income, their food security situation could worsen.

According to Etim and Patrick (2010), engagement in off-farm activity reduces household poverty. Oni *et al.*, (2011) argued that poverty is the main cause of food insecurity hence, reduction in poverty improves the food security level of households. Therefore, the expected effect on food security could be either positive or negative depending on how the money is used.

10. **Remittance:** This is the money an expatriate transfers to an individual or relatives in his or her home country. This comes mostly in the form of cash to supplement the regular household income used in financing the expenditure of cocoa farming households of which a major component is the purchasing of food items for members of the household. Findings from a study conducted by Regmi and Paudel (2016) suggest that the remittance money is very important to uplift the food security situation of rural people who are currently in the "poor food consumption" or "severe hunger" category when the remittance is wholly or substantially spent on food needs. In the long-run, remittance income can be used for investments in education and adoption of improved agriculture technology, which will simultaneously help alleviate food insecurity problems in developing countries. The expected effect of remittances on food security is positive.

11. **Income from working adult members:** This is the sum of all earnings contributed by working adult members of a household to support consumption of the entire members of the household in a calendar year. Babatunde *et al.,* (2007) defined income as the sum of earnings household from both off-farm and on-farm sources. According to Arene and Anyaeji (2010), the more a household head engage in gainful employment, the higher he or she obtains income and the greater chances of being food secure. The total annual income or cash flow is expected to increase the household's food production and access to more quantity and quality food if the income is spent on food. A positive effect is therefore expected on food security.
12. **Value of economic assets of household head:** This variable deals with the total monetary value of all fixed and current assets of the head of the cocoa farming households in the study area. Assets ranging from household appliances, plots of land, automobile, furniture, investments and especially livestock is considered to be cash on wheels, therefore it is expected that any household confronted with food shortage due to inadequate finances could dispose of some of these assets to make enough money to purchase food items for the household's consumption. Gebre (2012) found out the relationship between this variable and the food security status of households to be positive so it is therefore anticipated that the value of economic assets will have a positive effect on the dependent variable of this study.

Table 3.4 Factors influencing Food Security Status of the Cocoa Farming Households

Variable	Description	Measurement	A priori expectation
AHH	Age	Years	+/-
EDU	Educational level of hh head	Years	+
HHS	Household population (adult equivalent)	Number	-
DEP	Dependency Ratio	Ratio	-
ACT	Age of cocoa farm	Years	-
ACC	Access to credit	Yes = 1 No = 0	+/-
OFP	Own Food Production	Kg	+
COI	Income from Cocoa	GH¢	+
OFE	Off-farm Earnings	GH¢	+/-
REM	Remittance	GH¢	+
AWI	Adult working income	GH¢	+
AOW	Value of Economic Assets	GH¢	+

3.3.3 Comparing Food Security Indices between the Districts

In comparing the food security indices between the two districts for cocoa farming households, the study estimated separately the food security indices (*HCR, FIG_i , $SFIG_i$, SI*) of cocoa farming households in all the two districts selected in the region using the formula in equation (3.12). The mean food security indices were then compared using t-test. The indices were tested against the following hypothesis:

Statement of Hypotheses

1. $H_o = (\alpha_1 = \alpha_2)$: There is no significant difference between Head Count Ratio (HCR) of cocoa farming households between the two districts in the region.

   $H_a = (\alpha_1 \neq \alpha_2)$: There is a significant difference between Head Count Ratio (HCR) of cocoa farming households between the two districts in the region.

2. $H_o = (\beta_1 = \beta_2)$: There is no significant difference between the Food Insecurity Gap (FIG_i) of cocoa farming households between the two districts in the region.

   $H_a = (\beta_1 \neq \beta_2)$: There is a significant difference between the Food Insecurity Gap (FIG_i) of cocoa farming households between the two districts in the region.

3. $H_o = (\gamma_1 = \gamma_2)$: There is no significant difference between the Square Food Insecurity Gap ($SFIG_i$) of cocoa farming households between the two districts in the region.

   $H_a = (\gamma_1 \neq \gamma_2)$: There is a significant difference between the Square Food Insecurity Gap ($SFIG_i$) of cocoa farming households between the two districts in the region.

4. $H_o = (\delta_1 = \delta_2)$: There is no significant difference between the Surplus Index (SI) of cocoa farming households between the two districts in the region.

   $H_a = (\delta_1 \neq \delta_2)$: There is a significant difference between the Surplus Index (SI) of cocoa farming households between the two districts in the region.

If $t_{cal} > t_{tab}$: H_o is rejected in favour H_a however, If $t_{cal} < t_{tab}$: H_o is not rejected.

3.3.4 Comparing the index of coping strategies adopted by households between the study districts.

In comparing the index of coping strategies of cocoa farming households between the two districts, the study adopted the method used by Kyaw (2009) and Demi and Kuwornu (2013). This was achieved by estimating the index of coping strategies of all the cocoa farming households interviewed in the two districts in the region and compared the percentages. According to Maxwell (1996), the index of coping strategies used as a proxy for food insecurity is simple and quick to use by researchers, straightforward to understand by respondents and correlates well with more complex measures of food security (such as food security index).

The respondents were asked whether in the past 30 days there has been any occasion where there was not enough food in the house or inadequate money to purchase food. The respondents

who responded ‘Yes’ to the question were further asked to identify the coping strategies they used to reduce the impact of the food insecurity situation. Respondents were further asked the number of times each strategy was used per week which was then multiplied by four to obtain the number of times each strategy was used per month. This is because it is widely accepted that four weeks averagely makes a month.

To calculate the index of coping strategies, the number of different strategies used by each household was first summed up. The more food insecure households used more coping strategies compared to more food secure households (Kyaw, 2009). The weighted sum of these different coping strategies was then calculated where the weights represent or reflect the frequency of their food insecurity problem. The weighted sum was estimated by first, identifying the number of time(s) each particular strategy was used per month and assigned a score.

The score was assigned as follows: if a household never used a particular strategy it was counted as 1. Rarely used strategies (1 to 4 times per month) was counted as 2, from time to time (or 5 to 10) times was counted as 3, and often (or more than 10 times) was counted as 4 (Kyaw, 2009). Based on the index of coping strategies, the cocoa farming households were categorized into three groups: Low, Medium and High index of coping strategies. This is summarized in the table 3.5 below.

Table 3.5 Description of Index of Coping Strategies

Description	No. of times strategies were used per month	Index of coping strategies	Level of coping strategies
No strategy	0	1	No strategy
Rarely used	1 to 4	2	Low
From time to time	5 to 10	3	Medium
Often used	Above 10	4	High

3.3.5 Identifying and ranking the constraints of cocoa production in the study area.

This objective was achieved by reviewing literature to identify some common constraints encountered by farmers engaged in cocoa production in the country. These constraints were presented to the respondents (cocoa farmers) for confirmation or otherwise and later presented to them for selecting and ranking the constraints where applicable.

A number of methods have been developed for the ranking of objects 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 a close relation between Friedman's test and Kendall's coefficient of concordance (Legendre, 2005 pp. 229). They address hypotheses concerning the same data and use Chi square 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 (respondents) themselves.

Garrett's ranking score techniques on the other hand, uses the 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, among their rankings which the Friedman's test lacks. There are two approaches for computing Kendall's (W) statistic (upper and lower forms of equations 3.22 and 3.23 respectively) and both give the same result. S or S' is computed first from the row-marginal sums of ranks R_i received by the objects (Siegel, 1956; Siegel and Castellan, 1988):

$$S = \sum_{i=1}^{N} (R_i - \bar{R}) \qquad (3.23)$$

or

$$S = \sum_{i=1}^{N} R_i^2 = SSR \tag{3.24}$$

S is a sum-of-squares statistic over the row sums of ranks R_i. *R* is the mean of the R_i values. Following that, Kendall's *W* statistic can be obtained from either of the following formulae:

$$W = \frac{12S}{p^2(n^3 - n) - pT} \tag{3.25}$$

or

$$W = \frac{12S' - 3p^2 n(n+1)^2}{p^2(n^3 - n) - pT} \tag{3.26}$$

where *n* is the number of objects (i.e. Number of constraints to cocoa production = 10), *p* is the number of judges (i.e. Respondents = 260). *T* is a correction factor for tied ranks. If the test statistic (*W*) is 1, then all the judges or respondents have been unanimous, and each judge or respondent has assigned the same order to the list of objects or constraints. If (*W*) is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. Intermediate values of *W* indicate a greater or lesser degree of unanimity among the various judges or respondents.

Statement of Hypothesis

1. $H_o = (\alpha_1 = \alpha_2)$: There is no agreement among the rankers of the constraints to cocoa production in the study area.

   $H_a = (\alpha_1 \neq \alpha_2)$: There is an agreement among the rankers of the constraints to cocoa production in the study area.
2. $H_o = (\beta_1 = \beta_2)$: There is no agreement among the rankers of the constraints to cocoa production in Asante Akim South District of the study area.

   $H_a = (\beta_1 \neq \beta_2)$: There is an agreement among the rankers of the constraints to cocoa production in Asante Akim South District of the study area.

3. $H_o = (\gamma_1 = \gamma_2)$: There is no agreement among the rankers of the constraints to cocoa production in Ahafo Ano South District of the study area.

   $H_a = (\gamma_1 \neq \gamma_2)$: There is an agreement among the rankers of the constraints to cocoa production in Ahafo Ano South District of the study area.

3.4 Data Collection

This section of the study presents the types and source of data, the sample size, sampling techniques and the survey instrument used.

3.4.1 Types and Sources of Data

The data used in this study were mainly primary data obtained from the field survey. The primary data on the personal and socio-economic characteristics of the respondents (such as age of household head, gender, total annual income of household, household size, level of off-farm activity, educational status of household head, membership of co-operations/association and access to credit) were all obtained for analysis. In addition, accessibility of amenities and services such as potable water, electricity, telecommunication, healthcare and extension services were collected.

3.4.2 Sample Size and Sampling Techniques

A multistage sampling technique was used to select the respondents to be interviewed in three stages. The first stage involves the selection of districts from which respondents interviewed were selected and this was achieved using purposive sampling technique. This was done by acquiring a secondary data of all the cocoa producing districts and municipalities in the Ashanti Region from one of the leading Licensed Buying Companies (LBCs) of cocoa in the country which is PBC Limited. The top two districts producing and selling the highest quantity of cocoa were then selected hence the choice of Ahafo Ano South and Asante Akim South Districts.

The second stage dealt with the selection of communities and villages to be visited using simple random sampling. Names of all the 261 communities in the two districts were written on pieces of paper and placed in two bowls labeled "Ahafo Ano South" (118 communities) and "Asante Akim South" (143 communities). A staff of the CSSVD directorate was blindfolded and asked to pick four communities in each district. In all, eight (8) communities were selected from the two districts, these were Kunsu, Bronikrom, Mankranso and Adugyama for Ahafo Ano South District and Asankare, Adomfe, Wankyi and Bompata for the Asante Akim South District.

The third and final stage was the selection of the cocoa farming households that would be interviewed. The Snow-Ball technique was adopted in selecting the number of cocoa farming household heads to be interviewed. Upon arrival at each community, contacts with key stakeholders in cocoa production were made for direction to the houses of cocoa farmers. Houses of cocoa farmers were randomly selected and heads of each house were interviewed. After each interview directions to the next house of a cocoa farmer were asked. In each community an average of 32 household heads were interviewed regarding their socio-economic characteristics, food availability, food accessibility, access to credit and access to social amenities out of which data was obtained for analysis.

Table 3.6 Communities and Number of Households Interviewed

District	No.	Communities	No. of Respondents	Total
Asante Akim South	1.	Adomfe	33	130
	2.	Wankyi	32	
	3.	Asankare	32	
	4.	Bompata	33	
Ahafo Ano South	5.	Mankranso	33	130
	6.	Kunsu	34	
	7.	Bronikrom	32	
	8.	Adugyama	31	
Total				**260**

Source: Field Survey, 2016.

In all, 260 household heads were selected and interviewed for the study. The households were selected from two (2) districts and eight (8) communities. Food consumption data of 1759 individuals (sum of all household members) were obtained.

3.4.3 Survey Instrument

The main instrument used for the data collection in this study was structured questionnaire with both closed and open ended questions. This instrument covered data on personal and socio-economic characteristics, food production, food availability and accessibility, access to credit, access to social amenities and other data relevant to the analysis. Secondary information was also obtained from Ghana Cocoa Board, PBC Limited, Ghana Statistical Service and Ministry of Food and Agriculture.

3.4.4 Statistical Tool

The statistical software used in the analyses of the data includes Microsoft Excel (2010), Statistical Package for the Social Sciences (SPSS, Version 21) and STATA (Version 12.0). Excel and SPSS were used for mainly managing data as well as transforming the variables and STATA was used for the regression analyses.

3.5 Characteristics of the Study Area

The study was conducted in the Ashanti Region of Ghana.

Background

The Ashanti Region is a core area of the Asante Kingdom whose boundary in the 18th and 19th centuries stretched southwards towards the Atlantic Ocean (except the Anlo enclave), and northwards to the Gonja and Dagomba lands. It currently extends beyond the Ashanti Region in that some of the people of the Asante nation are in the Brong-Ahafo, Eastern and Central regions. History has it that the people of Asante originated from eight clans, namely, Oyoko,

Bretuo, Aduana, Asona, Asene, Ekuona, Agona and Asakyiri. The population of Asante is the largest among the Akan ethnic group that includes Akwamu, Guan, Fante, Denkyira, Brong, Akyem, Kwahu, Sefwi, Wassa, Akwapim and Assin (Osei, 1994).

Physical Features

The region lies in the southern half of the country Ghana and occupies 24,389 square kilometres or 10.2 percent of the total land area of Ghana. It is the third largest region after the Northern and Brong Ahafo Regions, respectively. It shares boundaries with the Western, Central, Eastern and Brong Ahafo Regions. The region has an average annual rainfall of 1,270 millimeters and two rainy seasons; the major season is from April to mid-August and the minor season is from September to November. The period December to March and mid-August to mid-September is relatively dry.

Population size

The population of the region according to GSS (2010) was 4,780,280, representing 19.4 percent of the total country population. This makes it the most populous and one of the most rapidly growing regions in the country. The level of urbanization in the Ashanti Region is higher than in all other regions except Greater Accra Region. The region's urban population first exceeded the rural population in year 2000 and increased further in the year 2010 (GSS, 2010).

Household Size

In the region, the household size is from one to more than 20 persons. The proportion of households decreases as size increases, from 19 percent for one-person households to 2.5 percent in nine-member households. Nearly half (47%) of households have 1-3 persons; about one-third (35.4%) have 4-6 persons, 13 percent have 7-9 persons and 4.5 percent have 10 and more people, which can be considered as large.

Agricultural Activities and Households

There are 412,055 agricultural households in the Ashanti Region, representing 16.5 percent of total agricultural households in the country (GSS, 2015). As a proportion of all households in the region, agricultural households form 36.6 percent. The average agricultural household size is 4.9 compared with an average household size of 4.2 for the region, suggesting that agricultural households are relatively larger. About 34.8 percent of agricultural households have 1-3 persons, 38.9 percent have 4-6 persons, 19 percent have 7-9 and the remaining 7.3 percent have 10 persons and more.

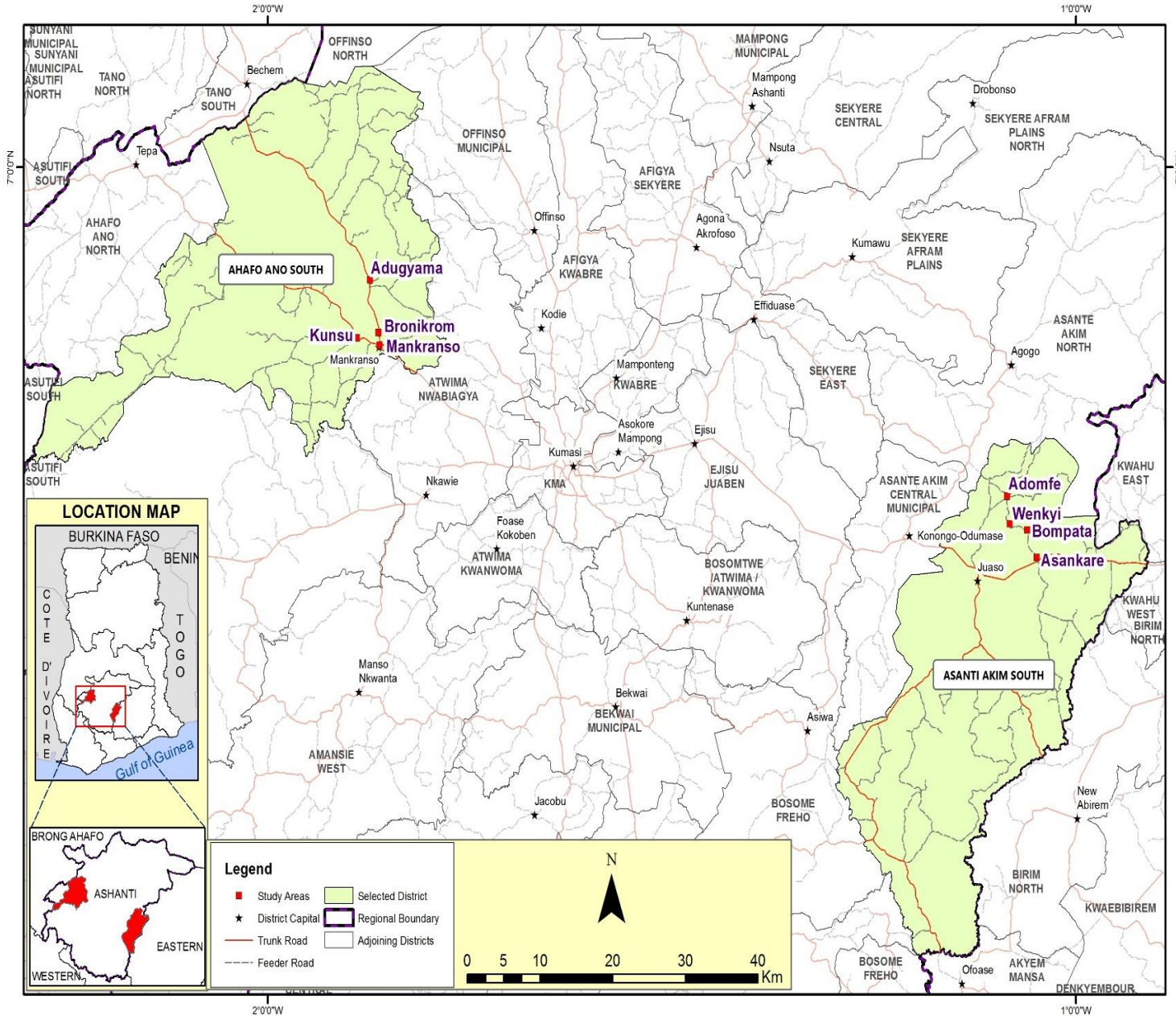
Heads of Agricultural Households

According to the GLSS by GSS (2014), the heads of agricultural households by sex and type of locality. The heads of the agricultural households in the region are predominantly male (67.2%). The female heads are 32.8 percent. In the urban areas, the male heads are 63.6 percent and the female heads are 36.4 percent, while in the rural areas, the male heads are relatively more than in the urban areas (68.6%) and the female heads are relatively fewer (31.4%).

Crops Cultivated and Number of Farms

There are 1,087,342 farms in the region, representing 16.4 percent of the 6,625,828 farms in Ghana. Among the crops, the proportion of cocoa farms is highest (22.1%), followed by cassava farms (21.6%), plantain farms (20.1%), and maize farms (11.3%). The maize farms are not many largely because their minor season coincided with the 2010 census. In the minor season, many farmers do not cultivate maize due to a high risk of crop failure as a result of inadequate and fluctuating rainfall patterns. The major tree crops in terms of number of farms after cocoa are oil palm and citrus, and far behind are cola, apples, mango, avocado and coffee.

Figure 3.2 Map of Southern Ghana showing the study area in Ashanti Region



Source: Centre for Remote Sensing and Geographic Information Services (CERGIS), 2016.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter discusses the result of the statistical analysis of the data collected from the research area. The chapter consists of two sections; first section describes the demographic and socio-economic characteristics of the respondents (cocoa farmers) and the second section presents the results of specific objectives outlined in this study. Simple statistics such as frequency and percentages were used to show the variation in the demographic and socio-economic characteristics of respondents (cocoa farming households) in the selected districts and communities.

4.2 Demographic Characteristics of Respondents

The demographic characteristics of respondents presented in this study are age, gender, marital status, ethnicity, and religion, household size and level of education of household head. All the demographic characteristics spoke to the effect on food security status of cocoa farming households.

The age of cocoa farming household heads in the study area ranged from 22 to 95 years with a mean age of 51.42. Result from table 4.1 indicates that majority of the respondents in the Asante Akim South District (51.5%) ranged between ages 40 to 59 years and 53.5% in Ahafo Ano South District. The category of cocoa farming household heads which falls into this age range (40 to 59) can be classified as active group since they have not yet reached the retirement age; hence, they can be relied on for any meaningful medium to long term agricultural improvement programmes. The most active group of the population which is also the most affected in terms of employment (i.e. 20 to 39 years) formed only 27.7% and 11.5% of the respondents in Asante Akim South and Ahafo Ano South Districts respectively.

However, the lower percentage of the age group of 20 to 39 years may be attributed to the fact that it is a school going age and perhaps most of the individuals within that age group were still in school. The low representation of the household heads who could be classified as youthful (20 to 39 years) in the study area may be attributed to the lack of interest in farming which is also mostly the case across the country by majority of the youth. The unemployment rate under Ghana's definition of the youth (15 to 35 years) is 16.9 percent (GSS, 2016) therefore engagement of the youth into agriculture would have been one solution to the unemployed youth as it requires less experience to operate in the sector (Amankrah, 2012). It can therefore be concluded that the household heads in the study area are in the age bracket which has the potential for influencing their food security status positively.

Table 4.1 Age Distribution of Household Heads

Age Group	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
20 - 39	36	27.7	15	11.5	51	19.6
40 - 59	67	51.5	72	55.4	139	53.5
60 - 100	27	20.8	43	33.1	70	26.9
Total	**130**	**100**	**130**	**100**	**260**	**100**

Maximum = 95, Minimum = 22, Mean = 51.42

Source: Field Survey, 2016.

The gender distribution of cocoa farming household heads in the study area is presented in table 4.2. The result shows that most of the cocoa farming households were male headed (75.4%) with females constituting only 24.6% of the respondents. The findings of this study are in line with that of the GSS (2014) as majority of the household heads in rural forest zones in the country are males. According to Babatunde *et al.,* (2007) and Demi and Kuwornu (2013), male headed households are more food secure due to their ability to secure job and cash

compared to female headed households. Therefore, gender distribution of the respondents favours the majority in the terms of the attainment of food security.

Table 4.2 Gender Distribution of Household Heads

Gender	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Male	107	82.3	89	68.5	196	75.4
Female	23	17.7	41	31.5	64	24.6
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

The result on marital status as indicated in table 4.3 shows that majority (81.9%) of the respondents were married and 18.1% were not married comprising of 3.5% single, 7.3% separated or divorced and 7.3% widowed household heads. It can therefore be said that majority of the children in the study area are most likely to enjoy the complements of both parents living which may positively influence their food security status.

This is important in ensuring food security since studies (Oxfam and Save the Children, 2008; UNICEF, 2009) indicate that women and children are the most vulnerable to food insecurity as a result of single parenting. It also implies that most women in the study area are expected to have support from their partners either in cash or kind. This goes a long way to improve the nutritional status of the children hence enhancing their food security status.

Table 4.3 Marital Status Distribution of Respondents

Gender	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Married	114	87.7	99	76.2	213	81.9
Single	4	3.1	5	3.8	9	3.5
Separated /Divorce	7	5.4	12	9.2	19	7.3
Widowed	5	3.8	14	10.8	19	7.3
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

Education is an important element of societal development and for that matter educational level is considered as an important index for human development and also in assessing a country's level of development. As such, a high literacy rate can be used as a basis to measure a country's level of development. However, the result of the study showed that there is a variation in the level of education across cocoa farming households in the eastern part of the study area (Asante Akim South District) and the western part (Ahafo Ano South District).

In table 4.4, the percentage of cocoa farming household heads without formal education was higher in Ahafo Ano South District (26.2%) as compared to those in Asante Akim South District (23.1%). Again, the proportion of cocoa farming household heads that had primary education (maximum of six years' education) in Asante Akim South District (16.2%) was higher than that of those in Ahafo Ano South District (12.3%).

Although Asante Akim South District had the higher percentage of respondents having primary education as compared to those in the Ahafo Ano South District but the percentage of household heads that have at least completed JSS or MSCL (in the case of the old system) in the Ahafo Ano South District was higher (56.2%) than what was observed in the Asante Akim District (52.3%).

The next level of education follows the same pattern in terms of cocoa farming households with a minimum qualification of SSCE/WASSCE, Ordinary or Advance level. In this case cocoa farming household heads in the Ahafo Ano South District recorded higher percentage (5.4%) than those in the Asante Akim South District (4.6%). However, the level of tertiary education among the cocoa farming household heads in the communities of Asante Akim South District were higher than that of the communities in the Ahafo Ano South District, which is (3.8%) as against (0.0%).

In general, the study showed that 24.6% of the respondents had no formal education, 14.2% had primary education, and 54.2% had completed at least JSS or Middle School Leaving Certificate while 5% and 1.9% had SSCE/O/A level and Tertiary educations respectively. This finding does not deviate entirely from the national statistics.

According to GSS (2014), nearly one-fifth of the adult population (19.7%) has never been to school while 44.6 percent have attained a level below Middle School Leaving Certificate (MSLC) or Basic Education Certificate Examination (BECE). About 21 percent of the population has MSLC/BECE and only 14.7 percent have acquired Secondary/Senior Secondary School (SSS) or Senior High School (SHS) or a higher level of education.

Table 4.4 Distribution of Level of Education of cocoa Farming Household Heads

Gender	**Asante Akim South District**		**Ahafo Ano South District**		**Total**	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Tertiary	5	3.8	0	0	5	1.9
SSCE/O/A Level	6	4.6	7	5.4	13	5
JSH/MSLC	68	52.3	73	56.2	141	54.2
Primary	21	16.2	16	12.3	37	14.2
None	30	23.1	34	26.2	64	24.6
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

From Table 4.5, household sizes in the range of 6 to 10 were the most represented in the study area (55%), 56.2% of the respondents in the Asante Akim South District and 53.8% of the respondents of Ahafo Ano South District belonged to this category. The maximum and minimum household sizes were 20 and 1 respectively. The mean household size was 6.69 which indicate a variation between findings of GSS (2010) of 4.1. This variation may be due to the fact that the sample size of this study is smaller than that of the PHC.

Households with high dependency ratios emanating from high number of household sizes would be seen to have a challenge with food security since high number of people depending on a household head adversely affects the food availability in the house. Results from the study area indicated majority of the cocoa farming household heads had an average sized number of dependents hence suggesting possible negative toll on food security.

Table 4.5 Household size Distribution of cocoa farming Household Heads

Household Size range	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1 – 5	44	33.8	47	36.2	91	35
6 – 10	73	56.2	70	53.8	143	55
11 – 15	11	8.5	11	8.5	22	8.5
16 - 20	2	1.5	2	1.5	4	1.5
Total	**130**	**100**	**130**	**100**	**260**	**100**

Maximum = 20, Minimum = 1, Mean = 6.69, Standard Deviation = 3.28

Source: Field Survey, 2016.

4.3 Socio-economic Characteristics of Respondents

The socio-economic characteristics presented in this section includes value of economic assets, livestock ownership, access to credit, membership of cocoa farming co-operatives, major source of drinking water, access to other social amenities (health care, extension service, electricity and telecommunication services).

value of economic assets is used as proxy to measure the wealth or poverty level of households (Geda *et al.*, 2001; Fofack, 2002). The asset base of households in the study area is shown in table 4.8 below. From Table 4.6, a majority of the respondents have access to manual farm tools such as cutlass (94.6%) and hoe (80%). The reason was that these tools are used by cocoa farming households for their daily faming activities. However, cocoa farmers in the communities in the study areas preferred the use of cutlass to hoe. Consequently, some do not use hoe at all. On the other hand, some cocoa farmers used both tools thus cutlass and hoe. The usage of hoe was very popular amongst cocoa farmers who intercropped their cocoa farms with yam.

Electrical gadget and appliances which can be classified as communication and entertainment tools such as television, radio, mobile phone, DVD and other devices like refrigerator and electric fan have low patronage in the study area. Apart from mobile phone and radio which have high patronage of 78.5% and 70.8% respectively, patronage in the rest of the electrical appliances; television (53.8%) was above average whilst that of electric fan (27.7%), refrigerator (24.2%) and DVD (20.4%) were below average. However, the low patronage of the usage of electrical appliances may be due to the lack of interest and money to acquire them by the cocoa farmers since the major determinant of the usage of this appliance (electricity) was present in all the communities visited.

Assets which can be categorized under natural resource like woodlot and land were owned by 1.2% and 56.5% of the cocoa farming household heads respectively. Furniture which consists of chairs, tables and beds were owned by 30.8% of the respondents. Other livelihood assets like house, motor or bicycle and car were owned by only 36.9%, 26.5% and 3.8% of the respondents interviewed respectively.

Table 4.6 Value of economic assets of Respondents

Asset	Yes (Possession)		No (Non-possession)	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Cutlass	246	94.6	14	5.4
Hoe	208	80	52	20
Woodlot	3	1.2	257	98.8
Furniture	80	30.8	180	69.2
Fridge	63	24.2	197	75.8
Television	140	53.8	120	46.2
Radio	184	70.8	76	29.2
Mobile phone	204	78.5	56	21.5
Electric fan	72	27.7	188	72.3
DVD	53	20.4	207	79.6
Car	10	3.8	250	96.2
Bike/Motor	69	26.5	191	73.5
Land	147	56.5	112	43.1
House	96	36.9	164	63.1

Source: Field Survey, 2016.

Livestock are social and economic capital which can be liquidated easily to supplement household income. Some farmers consider livestock as ‘cash on wheels’. Therefore, livestock ownership has the potential of improving the food security status of households. In Table 4.7, the result showed that only one respondent reared cattle representing 0.4%. The common livestock reared by the cocoa farming households was poultry (62.3%) followed by goat (41.9%). Cocoa farming households keeping livestock like sheep and pig were very low (15.8%) and (1.9%) respectively.

The reasons attributed to the low patronage of livestock (cattle and pig) are due to the incidence of disease in the raining seasons and also the complexity in rearing cattle and the social stigma attached to the rearing of pig. Few farmers who tried keeping livestock in the study areas were on countless occasions disappointed when they lost all their investment to pest and disease. The cocoa farmers are no longer keen in keeping livestock for fear of losing their investments

during disease outbreak. The high incidence of livestock theft as reported by farmers in the communities of the study area was partly due to the extensive (free roaming) system practiced by most cocoa farming households. Training farmers on zero grazing system of keeping livestock will help reduce this menace. Forming community watch-dog groups could also be helpful but the problem envisaged is the payment of remunerations to members in motivating the group.

Table 4.7 Livestock ownership of Respondents

Livestock	Yes (Possession)		No (Non-possession)	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Cattle	1	0.4	259	99.6
Sheep	41	15.8	219	84.2
Goat	109	41.9	151	58.1
Pig	5	1.9	255	98.1
Poultry	162	62.3	98	37.7

Source: Field Survey, 2016.

Difficulty in accessing credit is considered as one of the major challenges facing households especially those engaged in farming. The result of this study did not depart from this assertion. Access to credit has a positive impact on food security status of cocoa farming households as credit can serve as a consumption smoothing mechanism that household could use to supplement household income to purchase food. From Table 4.8, the result indicated that as high as 227 of the respondents did not have access to credit representing 87.3% whilst only a handful of them (33) representing 12.7% received credit. For those who had access to credit, 11.2% received production credit and 0.8% of them received consumption credit and other forms of credit. Similar findings were reported by Quaye (2008) in his study of food security in the three Northern Regions where he noted that 11%, 14% and 19% of farmers received credit in the Upper East, Northern and Upper West Regions. Out of the 33 cocoa farmers who

received credit, 20 of them (60.6%) said they received it on time whilst the remaining 13 (39.4%) lamented they did not receive the credit the time they needed it.

When cocoa farmers who had access to credit were interrogated on the effects of the credit on their production, 66.7% of them forming the majority said it increased their output, 18.2% claimed the credit had no effect on their output, 12.1% on the contrary lamented the credit actually had a negative effect on their production by reducing output and only 3% of them said it made their life easier and better without the credit necessarily being used for agricultural production.

Production credit is either cash or in-kind credit obtained for the purpose of augmenting farm input while consumption credit is used to supplement household income. However, interaction with respondents on problems in accessing credit revealed that out of the 227 respondents who did not get this credit, majority of them (53.3%) did not need it or were not interested in going for it at all, 26.4% of them attributed it to non-availability of credit institutions in the area, 17.2% said they lacked the collateral security in securing the credit and only 2.6% and 0.4% of them attributed it to unfair application process and lack of information respectively.

Again, moral hazards were considered as one of the major hindrances to access credit as some cocoa farmers breached their agreements with creditors. Most of the cocoa buying companies give credit to farmers with the hope of buying their products after harvest. However, most cocoa farmers who went for the loans end up diverting the sale of their products (cocoa beans) resulting in high default rates.

Table 4.8 Respondents' Access to Credit

Description	Category	Frequency	Percentage
Type of Credit	None	227	87.3
	Production	29	11.2
	Consumption	2	0.8
	Others	2	0.8
	Total	**260**	**100**
Timeliness of credit	Yes	20	60.6
	No	13	39.4
	Total	**33**	**100**
Effect of credit	Increased output	22	66.7
	Made life easier	1	3
	No effect	6	18.2
	Decreased output	4	12.1
	Total	**33**	**100**
Hindrance to credit access *(Farmers who did not have access to credit)*	Non-availability of credit institutions	60	26.4
	No collateral security	39	17.2
	Unfair processes	6	2.6
	Lack of information	1	0.4
	Nothing/not interested	121	53.3
	Total	**227**	**100**

Source: Field Survey, 2016.

Membership in an association is an avenue for the acquisition and dissemination of information. It also provides opportunity for farmers to acquire loans and credit facilities from financial institutions such as banks, savings and loans, and microfinance companies. In Table 4.9, most of the cocoa farmers (63.8%) did not belong to any co-operative or farmer based organization (FBO) whilst only 36.2% belonged to cocoa co-operative group in the study area. Most of the farmers in the Asante Akim South District (45.4%) belonged to a cocoa co-operative society compared to Ahafo Ano South District (26.9%). The co-operatives are under the guidance of the district CSSVD officer where farmers are provided with information regarding good cocoa farming practices. Cocoa farmers belonging to the co-operatives also

receive various support from government such as free training on how to improve yield and occasionally receive farm tools and machinery.

The co-operatives are also self-help organizations where cocoa farming households come together to help one another in times of difficulties such as funerals, sickness or any negative event affecting the family. These associations bring about social cohesion and promote caring for one another whilst fostering unity and sense of belongingness. However, it cannot be said to improve food security since most of the activities engaged in by these associations involve some form of financial commitment which further drains the income of members.

Table 4.9 Distribution of Respondents by Membership of Co-operative group

Belonging to co-operative	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	59	45.4	35	26.9	94	36.2
No	71	54.6	95	73.1	166	63.8
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

The various sources of drinking and household water used by the respondents (cocoa farming households) in the study area are presented in Table 4.10. As shown, majority of the households (63.1%) use boreholes and 20.8% use pipe borne water. hence constituting safe water which does not need further treatment before consumption. Respondents using unsafe drinking water were 11.2% for river or stream water and 5.0% use hand dug well water.

Most of the cocoa farming households using unsafe drinking water do not treat the water before usage even though they admitted knowing the consequences of their actions. Some argued they have diarrhea after drinking pipe borne water since, according to them, their systems are used to ground water.

Table 4.10 Respondents' major sources of Drinking water

Household Size range	Asante Akim South District		Ahafo Ano South District		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Pipe borne	21	16.2	33	25.4	54	20.8
River/stream	26	20	3	2.3	29	11.2
Borehole	72	55.4	92	70.8	164	63.1
Hand dug well	11	8.5	2	1.5	13	5
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

Table 4.11 shows the distributions of respondents' access to other social amenities. Health care is paramount to every individual's well-being and for that matter it is considered a critical element of a country's development. Nkum and Ghartey (2000) observed that one of the important indicators of poverty is the inability to afford health care. On the other hand, Sen (1998) notes that a country's level of development depends on various social and physical conditions, for example, the availability of health care, orderliness of urban living and access to modern medical knowledge. It was found that, 232 of the respondents representing 89.2% had access to health care (herbal clinics, CHIP compounds, hospitals) and only 28 of the respondents (10.8%) said they did not have access to any health care when they need them.

Extension service from the various agricultural agencies (CSSVD, MOFA) in the districts enhance information dissemination on the good agricultural practices thereby improving productivity and yield of cocoa farmers. It may be hypothesized that a farmer's access to extension services would enhance his/her food security status. Majority of the cocoa farmers interviewed (55%) mentioned that they had access to extension services in the last season and 45% did not have access.

Access to electricity is important to the food security status of cocoa farmers because it influences the application of certain technologies and availability of information. Respondents

in the study area had access to electricity in their communities made possible by the rural electrification project of the government. The survey shows that 89.6% had access to electricity whilst only 10.4% did not have access. Households without access were far from the main power grid and also faced financial constraints.

Respondents in the study area had access to telecommunication services since most of them (92.3%) confirmed their access and only 7.7% did not have access. Therefore, if telecommunication services are very useful in making production activities of cocoa farmers go on smoothly then it can be said that the respondents in the study area have a better chance of being food secured.

The summary results show that respondents in the study area had access to all the social amenities (water, extension, health care, electricity and telecommunication services); Availability of social amenities has a positive influence to their food security status.

Table 4.11 Access to other Social Amenities

Description	Category	Frequency	Percentage
Health care	Yes	232	89.2
	No	28	10.8
	Total	**260**	**100**
Extension service	Yes	143	55
	No	117	45
	Total	**260**	**100**
Electricity	Yes	233	89.6
	No	27	10.4
	Total	**260**	**100**
Telecommunication	Yes	240	92.3
	No	20	7.7
	Total	**260**	**100**

Source: Field Survey, 2016.

4.4 Food Security Status of Cocoa Farming Households in the study area

The food security status of respondents using the recommended daily calorie intake of 2,900 kcal and 2,260 kcal is presented in table 4.12. It indicates that majority of respondents (73%) were food secure whilst 27% were food insecure.

When the RDI of 2,260 kcal as suggested by the FAO is used the food secured respondents increased to 85% and that of food insecure respondents decreased to only 15%. This therefore affirms the result of the GSS and IFPRI (2000) standard that the majority of the respondents in the study area are food secure.

The statistics of the food security status of the cocoa farming households showed that the mean food security index for those households who were found to be food secure was 2.28 and 2.67 for GSS/IFPRI and FAO standards respectively (above the threshold of 1). The mean food security index for the food insecure households were also found to be 0.72 and 0.76 respectively for GSS and FAO standards (below the threshold of 1). The adult equivalent household size for food secure households under the GSS and FAO recommended calorie intake standards were 840 and 1044 respectively whilst that for food insecure households were 509 and 305 respectively. The household per capita calorie intake (obtained by dividing the daily calorie intake of each household by the household size) was estimated and the result is presented in table 4.12. The weighted mean per capita calorie intake of the farming households was estimated to be 3891 kcal which was above the national average of 2849 kcal.

These indices were higher compared to what was found by Quainoo (2010), Pappoe (2011) and Demi (2013). However, Quainoo (2010) and Pappoe (2011) used three food items (maize, rice and cassava) and Demi (2013) on the other hand used four staple food items (maize, rice, cassava and plantain) in their analysis and also considered crop farmers in the coastal communities in the Central Region of Ghana.

Table 4.12 Food Security Status of Respondents based on 100% GSS/IFPRI Standard

Description	GSS/IFPRI 100% (2900Kcal)		FAO 100% (2260Kcal)		Total
	FS	**FI**	**FS**	**FI**	
Percentage of Household	73	27	85	15	**100**
Number of Households	189	71	222	38	**260**
Household population *(Adult equivalent)*	840	509	1044	305	**1349**
Mean (FSI)	2.23	0.73	2.67	0.76	
Standard Deviation	1.626	0.183	2.180	0.177	
Per Capita Daily Calorie Allowable					**3,891kcal**

FS = Food Secure FI = Food Insecure

Source: Field Survey, 2016.

In a study done by Maxwell *et al.*, (2000), 80% of the calorie requirement was used to determine the food security status of women biofuel crop farmers, the study estimated the food security indices using 80% of 2,900kcal and 2,260kcal to note the variations in the food security status of the respondents. Based on the above, this study also computed the food security status index of the respondents using 80% calorie requirement standard. This is presented in table 4.13.

Table 4.13 Food Security Status of Respondents based on 80% of GSS/IFPRI Standard

Description	GSS/IFPRI 80% (2320Kcal)		FAO 80% (1808Kcal)		Total
	FS	**FI**	**FS**	**FI**	
Percentage of Household	84	16	92	8	**100**
Number of Household	218	42	238	22	**260**
Household population *(Adult equivalent)*	1021	328	1169	180	**1349**
Average HH Size	4.6	7.8	4.9	8.2	**5.2**
Mean (FSI)	2.63	0.76	3.19	0.78	
Standard Deviation	2.131	0.180	2.687	0.127	
Food Insecurity Gap/Surplus Index	1.64	-0.23	2.19	-0.22	

FS = Food Secure FI = Food Insecure

Source: Field Survey, 2016.

Results in table 4.13 using the recommended daily calorie intake of 2,320 kcal (80% of 2900 kcal), it was found that the percentage of food insecure households decreased from 27 to 16 whilst that of food secure households saw an increase from 73 to 84. The same measure was used for 1,808 kcal (which is 80% of 2,260 kcal) and the result of the study indicates that majority (92%) of the respondents were food secure as against 8% who were found to be food insecure.

The statistics also showed that the mean food security index of food secure were 2.63 and 3.19 for recommended daily calorie intake of 2320 kcal and 1808 kcal (80% of 2900 and 2260 kcal) respectively. The mean index of food insecure households was found to be 0.76 and 0.78 for recommended daily calorie intake of 2320 kcal and 1808 kcal respectively.

The mean food insecurity gaps which measure the depth of food insecurity were also estimated as -0.23 for 2320 kcal and -0.22 for 1808 kcal. The mean surplus indices for both standards were estimated as 0.23 for 2320 kcal and 0.22 for 1808 kcal. This implies that on average, food secure households consumed 164% and 219% in excess of their daily calorie requirement for

GSS/IFPRI and FAO standards respectively. The percentages of food insecurity gaps imply food insecure households required an additional 23% and 22% of calorie intake to meet their daily calorie requirements for 80% of GSS/IFPRI and FAO standards respectively.

4.5 Estimating the determinants of Food Security status of cocoa farming households

In estimating the determinants of food security status of cocoa farming households, food security indices of the cocoa farming households were regressed on socio-economic characteristics. The result of the logistic regression model presented in table 4.14 showed that two variables (age of household head and household size) were significant in explaining the food security status of the cocoa farming households in the Asante Akim South District. On the other hand, four variables; household size, access to credit, own food production and income generated from cocoa production were significant in determining the food security status of the cocoa farming households in the Ahafo Ano South District. Household size of cocoa farming households was significant in both districts and its marginal effect was negative, hence an increase in the number of members of a particular cocoa farming household affects negatively their food security status. Only one variable (income from cocoa) could not meet its priori expectation. Income from cocoa production was expected to have a positive marginal effect but showed a negative effect on the food security status.

Age of household heads was significant and it had a negative marginal effect in determining the food security status of the household in Asante Akim South but was not significant in Ahafo Ano South District. The reason might be that more household heads in the age category of 60 years and above is higher in the Asante Akim South District as compared to those in the Ahafo Ano South District. This implies that, as the age of household heads increase it affects negatively their ability to produce food crops or engage in other non-farming activities for food that directly limit their chance of being food secure.

Access to credit by the household heads was a relevant variable influencing the food security status of cocoa farming households in the Ahafo Ano South District only and its impact was positive. This means that an increase in the number of people who have access to credit facilities would increase their food security hence making more households food secure. The possible reason why this variable was not relevant in the Asante Akim South District is that, the amount of credit received by household heads to produce cocoa or to supplement their household consumption were higher in the communities of Ahafo Ano South District than the amount of credit received by those in Asante Akim District. This may also be linked to the availability of more credit institutions and high level of education of the cocoa farmers in accessing financial assistance.

Own food production was also a significant determinant in the food security status of cocoa farming households but only in the Ahafo Ano South District. The marginal effect of own food production on the food security status was positive which implies an increase in the quantity of food crops produced for household consumption increase the number of households who are food secure. This variable was not significant in Asante Akim South District possibly, because the amount of food crops produced and harvested solely in sustaining the household's consumption is less than the amount of food crops produced and harvested for household consumption in the Asante Akim South District.

The income from cocoa production was significant and had a negative marginal effect on the food security of the cocoa farming households in the communities of Ahafo Ano South District but not significant in the case of the cocoa farming households in the Asante Akim South District. The marginal effect of this variable indicates that when the income generated from cocoa production increases the household in the district would be more vulnerable hence more food insecure. It was hypothesized that income generated from the sale of cocoa beans would affect positively their food security but this was not the case. The reason for this outcome could

be the misapplication of cocoa farmers of their main source of income in acquiring assets and other non-food materials which does not have direct relation to their food consumption and food security.

Table 4.14 Marginal Effects of food security status determinants in the study districts

Variable	Asante Akim South			Ahafo Ano South		
	Marginal Effect	**Standard Error**	**P>z**	**Marginal Effect**	**Standard Error**	**P>z**
Age	-0.0053523**	0.00261	0.041	-0.007281	0.00457	0.111
Education	-0.0039916	0.00667	0.549	-0.0128957	0.01396	0.356
Household population	-0.0449884***	0.01462	0.002	-0.0808225***	0.02108	0.000
Dependency Ratio	0.0249379	0.02366	0.292	0.0790835	0.03955	0.046
Age of cocoa farm	0.0031168	0.00476	0.513	-0.0036632	0.00569	0.520
Access to credit	-0.0131991	0.07602	0.862	0.2239315**	0.10416	0.032
Own Food Production	-4.48e-08	0.00000	0.981	0.0000109**	0.00000	0.016
Income from Cocoa	-2.45e-06	0.00000	0.607	-0.0000286**	0.00001	0.034
Off-farm Earnings	-2.68e-06	0.00002	0.899	-0.0000167	0.00004	0.699
Remittance	.0000567	0.00006	0.346	0.000042	0.00005	0.364
Adult working income	.0000895	0.00013	0.476	-0.0002167	0.00015	0.159
Economic Assets	4.66e-06	0.00000	0.200	0.0000145	0.00001	0.077
No. of observation	**130**			**130**		
Wald chi^2 (12)	**-46.582126**			**-60.167568**		
Prob > chi^2	**0.0006**			**0.0000**		
Log likelihood	**34.12**			**48.61**		
Pseudo R^2	**0.2681**			**0.2877**		

*** Significant at 1%, ** Significant at 5% and * Significant at 10%
Source: Field Survey, 2016.

Table 4.15 presents the Logit Regression results of the overall model of factors influencing the food security status of the cocoa farming households. The result in table 4.15 showed that six (6) variables are the key determinants of food security status of households in the study area. Three variables; dependency ratio, own food production and value of economic assets had positive effect on the food security status whilst age, household size and adult working income had a negative effect on the food security status of the households. Four out of six variables

met their a priori expectation with only two variables (dependency ratio and adult working income) which were expected to have a negative and positive marginal effect respectively but rather had a positive and negative effect on the food security status.

Table 4.15 Marginal Effects of Food Security Determinants of Cocoa Farming Households

Variable	Marginal Effect	Standard Error	P>z
Age	-0.0065244***	0.00243	0.007
Education	-0.0075459	0.00708	0.287
Household size	-0.0689151***	0.0116	0.000
Dependency Ratio	0.0476906**	0.02296	0.038
Age of cocoa farm	-0.0028376	0.00364	0.435
Access to credit	0.0600638	0.07604	0.430
Own Food Production	3.84e-06*	0.00000	0.086
Income from Cocoa	-5.48e-06	0.00001	0.336
Off-farm Earnings	-7.33e-06	0.00002	0.749
Remittance	0.0000351	0.00003	0.246
Adult working income	-0.0001114*	0.00007	0.088
Value of economic assets	8.82e-06**	0.00000	0.029
No. of observation	**260**		
Wald chi^2 (12)	**78.04**		
Prob > chi^2	**0.0000**		
Log likelihood	**-113.41701**		
Pseudo R^2	**0.2560**		

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

Source: Field Survey, 2016.

From the table 4.15, the Chi-square value of 78.04 which is the likelihood ratio statistic was significant at 1% level. This explains that the explanatory variables included in the model jointly explained the food security status of cocoa farming households in the study area. A Pseudo R^2 value of 0.2560 means that only 25.6% of variation in the dependent variable (food security status) was explained by the explanatory or independent variables.

Age of household head

As hypothesized the age of cocoa farming household heads in the study area was significant and had a negative effect on their food security status. The negative effect implies that an increase in the age of household heads would result in an adverse impact on the food security status of the households. Therefore, if a household head age increased by one year, there would be a reduction in the food security index by 0.0065. The strength and ability to produce or cultivate large land size for food reduces with age of household heads and all members in the household who are also engaged in the production hence affecting the quantity of food available in the house for consumption. This situation adversely affects the food security status of the household.

This finding is consistent with (Gebre, 2012). Bashir *et al.,* (2012) in estimating the determinants of Food Insecurity among households in Addis Ababa City, Ethiopia found that aged household heads are more vulnerable in terms of food security than younger or youthful household heads.

Household population (Adult equivalent)

This refers to the number of members in the household who eat from the same pot. The household size was statistically significant and had a negative effect on the food security status of the households. This implies that, the introduction of an additional member to the household would have a negative effect on the food security status of the household and reduce the index by 0.0689. It can be said that, the higher the number of people or members in a household, the lower the food security status.

This finding agrees with that of Gebre (2012), Bashir *et al.,* (2012) and Ojeleye *et. al.,* (2014). In the findings of Aidoo *et. al.,* (2013) the determinants of household food security in the Sekyere-Afram Plains District it was found that households with large number of members have lower food security index that affects their food security status.

Dependency Ratio

Dependency ratio of households was found to be significant and had a positive relationship with the food security. This is unexpected because an increase in the number of non-working members of households increases the quantity of food required to feed them thereby reducing the likelihood of the household's food security. On the contrary, the finding of this study showed that when one non-working person is added to the number of the household, their food security index would increase by 0.0747. This could be possible when dependent members of the household contribute to the food crop production by working on the farm to increase the quantity harvested for consumption and the remaining sold to supplement the expenses of the household.

Own food production

Own food production was significant and was found to be positive. The positive marginal effect of the variable means that the higher the output or quantity of harvested food crops, the greater the probability of the household being food secured. One unit increase in the quantity of household own food production increases the probability of the food security by 0.0000038. The result of this study is consistent with earlier findings by Quainoo (2010), Pappoe (2011) and Kuwornu *et. al.,* (2013). It is also in line with the findings of Babatunde *et al.,* (2007) and Ojeleye *et. al.,* (2014) who conducted their studies on households in Nigeria. Ojogho (2010), observed that lower quantity of food crops produced by households for domestic consumption decreases the food security status of arable farmers of Edo State in Nigeria.

Adult working income

Income of working adult members of households was also significant at xx level and found to have a negative impact on food security. This is contrary to expectation. Monetary contributions by working household members increase the total disposable income which is used by the household head in purchasing food and other household consumables thereby

reducing the incidence of poverty and enhancing food security. The finding of this study indicates that a cedi increment in the total disposable income of households in the study area via adult working income decreases the likelihood of households being food insecure by 0.00011. The reason for this situation could be that, moneys contributed by working adult members of the household are diverted into other uses instead of buying food and consumables. It could also be that the money contributed is not proportionate to the food needs of the household.

This study finding is consistent with Bashir *et al.*, (2012) in a study conducted to assess Food security and its determinants at the crossroads in Punjab, Pakistan.

Value of economic assets

This is the total value of both current and non-current assets owned by cocoa farming household heads in the study area. This variable was significant and had a positive marginal effect on the food security status of the households. A unit (GH¢1.00) increase in the value of assets owned by household heads would cause the probability of a household being food secured in the study area to increase by 0.0000088. The food security situation of households with high assets value would be better as compared to those with low assets value because those with high assets value could easily liquidate some of the assets to get enough money to buy household food in catering for members without losing so much.

The finding is consistent with a study by Gebre (2012) which states that an increase in the assets value of a household would decrease the incidence of food insecurity.

4.6 Comparing Food Security Indices in the Region

In table 4.16 food security indices of cocoa farming households in both Asante Akim South and Ahafo Ano South Districts were estimated and difference of means were tested using t-test. The indices tested include head count ratio (*HCR*), mean food insecurity gap (FIG_i), mean square food insecurity gap ($SFIG_i$) and mean surplus index (*SI*). Head count ratio measures the

proportion of households which were food insecure and the result shows that more cocoa farmers and their dependents (household) were more food insecure in the communities of Ahafo Ano South as compared to communities in Asante Akim South District which were 14.04% and 13.80% respectively using the RDI of 2900 kcal as suggested by GSS and IFPRI.

The t-test result shows that HCR was statistically significant. This implies that there is a significant difference between the head count ratio of the food insecure households in Ahafo Ano South District and those in Asante Akim South District hence the rejecting of the null hypothesis. Food insecurity gap (FIG) 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 values of food insecurity gap imply that on the average, food insecure households in Ahafo Ano South require an additional 28% of what they consumed to become food secure while those in Asante Akim South require an additional 26% of what they consumed to meet the threshold of food security. In other words, food consumption level of food insecure cocoa farming households fell short by 28% and 26% in Ahafo Ano South and Asante Akim South respectively. Square food insecurity gap measures the extent of food insecurity while surplus index measures excess of calorie consumed.

Results from the t-test also indicates that the FIG_i, $SFIG_i$ and SI were all not statistically significant and thus the null hypothesis which states that there is no significant difference in these indices between Asante Akim South and Ahafo Ano South is therefore not rejected.

Table 4.16 Comparing Food Security Indices of Respondents in the Districts based on the GSS/IFPRI Standard (2900kcal)

Indices	Means		t-stat	df	Sig (2-tailed)	Decision
	Asante Akim	Ahafo Ano				
HCR(%)	13.80	14.04	5.195	35	0.000	Reject
FIG_i	-0.26	-0.28	0.484	53	0.630	Accept
$SFIG_i$	0.10	0.11	-0.613	56	0.542	Accept
SI	0.26	0.28	-0.484	53	0.630	Accept

FIG_i, $SFIG_i$ and *SI* are mean values.
Source: Field Survey, 2016.

From table 4.17, it can be said that among the communities in the district with a higher food insecurity incidence (Ahafo Ano South), Bronikrom recorded the highest number of respondents who are food insecure (50%) with Mankranso the district capital recording the least (12%). In the district with a lower food insecurity incidence (Asante Akim South), Wankyi (25%) and Bompata (12%) recorded the highest and lowest respondents of food insecurity respectively.

Table 4.17 Comparison of Food Security Indices of Cocoa Farming Households in the Communities of the study area

Communities/ District	Frequency			Mean				Std. Deviation
Asante Akim South	**N**	**FS**	**FI**	**FSI**	**FIG**	**SFIG**	**HCR (%)**	
Adomfe	33	27	6	1.83	-0.14	0.03	0.18	1.03
Wankyi	32	24	8	1.97	-0.31	0.13	0.25	1.67
Asankare	32	25	7	2.00	-0.27	0.10	0.22	2.48
Bompata	33	29	4	2.03	-0.33	0.13	0.12	1.06
Ahafo Ano South								
Mankranso	33	29	4	2.12	-0.18	0.04	0.12	1.74
Kunsu	34	21	13	1.60	-0.31	0.14	0.38	1.41
Bronikrom	32	16	16	1.60	-0.31	0.13	0.50	1.49
Adugyama	31	18	13	1.41	-0.26	0.09	0.42	0.89
Total	**260**	**189**	**71**					

N = Sample, FS = Food Secure, FI = Food Insecure, FSI = Food Security Index
Source: Field Survey, 2016.

4.7 Prevailing Food Insecurity Coping Strategies used by cocoa farming households

The dominant coping strategies used by cocoa farming households to fight against the impact of food insecurity in the study area are presented in table 4.18. The results indicate that the most common coping strategy used by the respondents was eating less preferred food with a mean score of 2.23, followed by borrowing money from cocoa purchasing clerks (2.39) and maternal buffering (the practice where parents forgo their food to enable their children have enough when there was insufficient food in the house or not enough money to buy food) with mean score of 3.36 placing 1st, 2nd and 3rd in the ranking respectively.

The result does not conform to the findings of Orewa and Iyangba (2010b), and Demi and Kuwornu (2013) who found eating less preferred food, food rationing and skipping meal within a day (taking 1st, 2nd and 3rd ranks respectively) as common strategies adopted by farming households. This difference in results can be attributed to the fact that respondents for the study are very different (Crop farmers and Cocoa farmers) and also due to dissimilarity in the study area (Nigeria and Ghana).

Borrowing food (from family and friends) had a mean score of 4.08 placing fourth (4th) on the rankings. Skipping meals within a day, food rationing (limiting the size and quantity of food consumed), hunting and gathering (food from the bush) placed 5th, 6th and 7th with mean scores of 5.15, 5.50 and 6.93. The least dominant coping strategies ranked were cocoa farmers disposing off their assets and them traveling in search of jobs to generate money to cater for their family with a mean score of 7.17 and 8.19 placing 8th and 9th respectively.

Table 4.18 Ranking of coping strategies used by respondents

Coping Strategies	Mean Score	Rank
Eating less preferred food	2.23	1st
Borrowing money from cocoa purchasing clerks	2.39	2nd
Maternal buffering	3.36	3rd
Borrowing food	4.08	4th
Skipping meals	5.15	5th
Food rationing	5.50	6th
Hunting and gathering	6.93	7th
Disposing off assets	7.17	8th
Travel to search for jobs	8.19	9th
Kendall's W = 0.615	**x^2 = 1279.617**	**df = 8** **Sig. = 0.000**

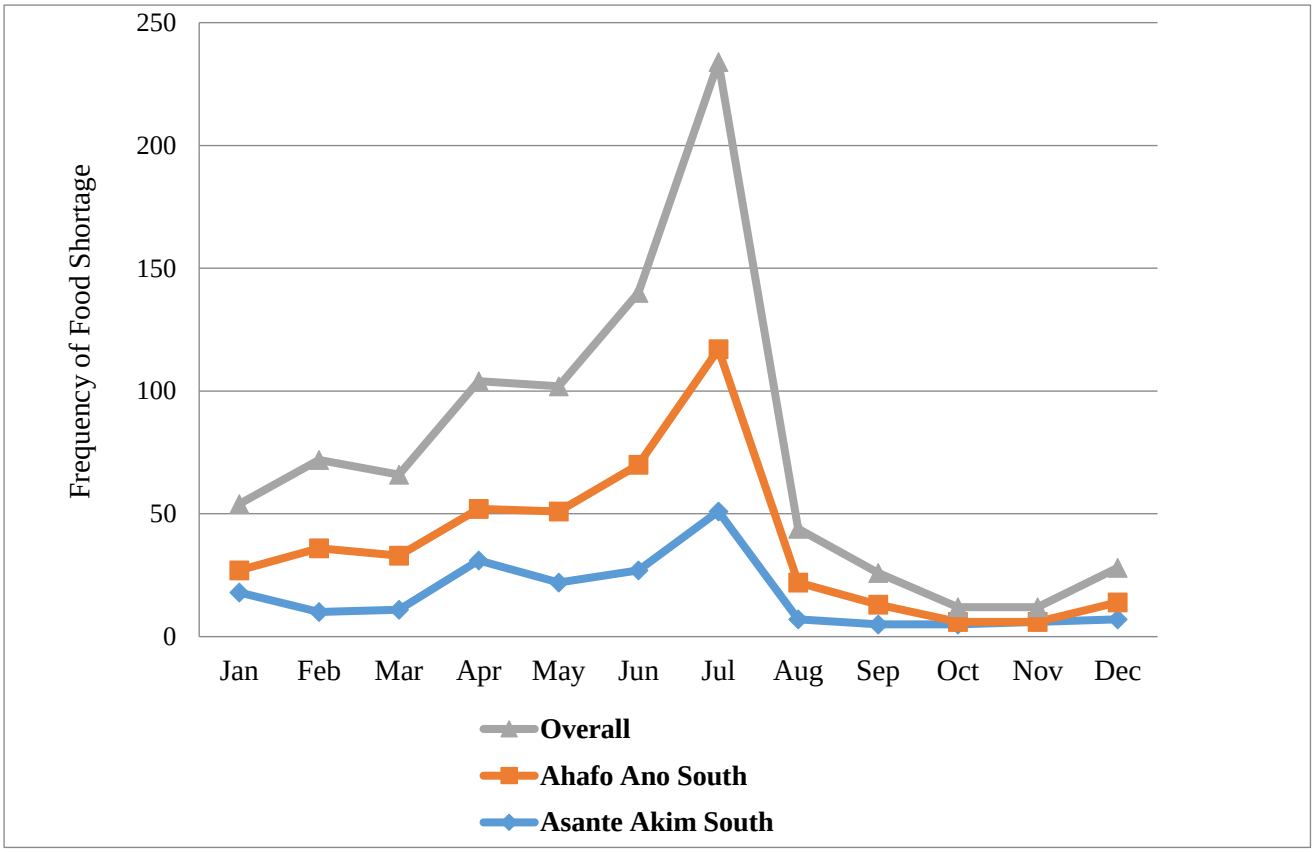
Source: Field Survey, 2016.

The mean scores were arranged in ascending order (from lowest to highest) and the lowest mean score was considered 1st rank. The reason being that, nine (9) items were ranked and one (1) was assigned the most pressing and nine (9) the least pressing in that order. The Kendall's Coefficient of Concordance (Kendall's W) of 0.615 means that the level of agreement among the rankers (respondents) was 61.5%. The chi-square (x^2) was 1279.617 with a degree of freedom (*df*) of 8 and it was significant at 1%.

4.8 Periods when cocoa farmers experienced food shortage

Cocoa farming household heads were asked whether or not they have experienced food shortage in the previous year (2015). Those who responded in affirmative were further asked to indicate the month(s) during which they experienced the food shortage. The frequencies are shown in figure 4.1.

Figure 4.1 Months households experience food shortage



Source: Field Survey, 2016.

From figure 4.1 above, the blue line graph represents Asante Akim South District, the orange line graph represents Ahafo Ano South and the grey line graph represents overall (both Asante Akim South and Ahafo Ano South Districts).

Ashanti Region has a bimodal rainy season (major and minor). The major season starts in March and ends in July while the minor season starts in September and ends in October during which the areas receive little rainfall. However, it is during the major season that most serious farming activities take place. Cocoa farmers engage in their main production (cocoa) even in the minor season and also interspersing them with the planting of food crops. Production of food crops starts in March and August where most of the farmers would have harvested their food crops which marks the commencement of the abundance of food (glut) depending on the changes in the weather. This continues till December, and from January depletion of household

harvested food begins. Cocoa farmers harvest and sell their cocoa beans from October to May (Main crop) and from June to September (Light crop). The availability of money for buying household's food items largely depends on these seasons in their harvest. Figure 4.1 shows that severity of food shortage among cocoa farmers highest in July.

4.9 Comparing the index of coping strategies adopted by cocoa farming households between the districts of the study area.

To determine the level of food insecurity among cocoa farming households in the Asante Akim South and Ahafo Ano South Districts, the coping strategies used by the households to reduce the impact of food insecurity were converted into indices and presented in table 4.19. Comparing the index of coping strategies between the two districts, the study showed that the proportion of cocoa farming households who practice no strategy was high in communities of Asante Akim South District (53.08%) than the communities of Ahafo Ano South District (21.54%).

On the contrary the proportion of households who used low index of coping strategies was high in Ahafo Ano South District than Asante Akim South District with a percentage of 32.31% and 24.61% respectively. Again, the cocoa farming households who used medium and high coping strategies index were higher in Ahafo Ano South District (44.11% and 1.54%) than the households in the Asante Akim South District (21.54% and 0.77%).

In the pooled or overall results of the coping strategies indices, 37.31% of the households practiced no strategy which implies that 37% of the households in the study area were food secure throughout the year (2015) whilst majority (63%) were food insecure since they used one coping strategy or the other to mitigate food shortage. Among households who used coping strategies, medium index of coping strategies recorded the highest (33.08%) followed by low index (28.46%) and high index (1.15) being the lowest.

Table 4.19 Index of coping strategies used by cocoa farming households

Coping Strategies	Asante Akim South		Ahafo Ano South		Overall	
	Freq.	%	Freq.	%	Freq.	%
No Strategies	69	53.08	28	21.54	97	37.31
Low Index	32	24.61	42	32.31	74	28.46
Medium Index	28	21.54	58	44.61	86	33.08
High Index	1	0.77	2	1.54	3	1.15
Total	**130**	**100**	**130**	**100**	**260**	**100**

Source: Field Survey, 2016.

4.10 Identifying and ranking the constraints of cocoa production in the study area.

In this section constraints were identified from literature, pre-tested and presented to respondents to be ranked from the most pressing (1) to the least pressing (10). The constraints of cocoa production identified included high cost of inputs, inadequate supply of government inputs, pest and diseases, aging cocoa trees (affecting the output), low purchase price by LBCs, high cost of labour, lack of capital, poor rainfall pattern, theft of produce (cocoa beans) and incidence of bush fires. The result is presented in table 4.20.

Table 4.20 Constraints to Cocoa production in the study area

Constraints	Asante Akim South		Ahafo Ano South		Pooled	
	Mean Score	**Rank**	**Mean Score**	**Rank**	**Mean Score**	**Rank**
High cost of inputs	1.27	1st	1.76	1st	1.76	1st
Pest and diseases	2.71	3rd	2.20	2nd	2.45	2nd
Inadequate supply of government inputs	2.41	2nd	5.86	5th	4.13	3rd
Low purchase price by LBCs	5.23	5th	4.19	3rd	4.71	4th
Lack of capital	6.45	6th	4.49	4th	5.47	5th
Aging cocoa trees	4.36	4th	6.67	7th	5.50	6th
High cost of labour	6.76	7th	7.10	8th	6.93	7th
Incidence of bush fires	8.45	9th	6.25	6th	7.35	8th
Poor rainfall pattern	8.23	8th	7.76	9th	8.00	9th
Theft of produce (cocoa beans)	8.63	10th	8.71	10th	8.67	10th
Diagnostic Statistics						
Number of observation	**130**		**130**		**260**	
Kendall's W	**0.742**		**0.577**		**0.576**	
Chi-square calculated	**867.776**		**675.360**		**1347.293**	
Chi-square critical	**16.919**		**16.919**		**16.919**	
Degree of freedom (df)	**9**		**9**		**9**	
Asymptotic sig.	**0.000**		**0.000**		**0.000**	

Source: Field Survey, 2016.

From the table above, Kendall's technique of ranking for the pooled sample indicated that high cost of inputs, pest and diseases and inadequate supply of government inputs were the three most pressing constraints identified by the respondents with mean scores of 1.76, 2.45 and 4.13 respectively.

Kendall's W for the ranked constraints was 0.576 which implies there is 57.60% agreement among the rankers of the constraints. The chi-square calculated from the simulation was 1347.293 and the chi-square obtained from the statistical table with 5% (0.05) significance level and 9 degrees of freedom was 16.919. It can be therefore concluded that since the chi-square calculated from the Kendall's concordance simulation is greater that the chi-square

obtained from the statistical table, the null hypothesis was not accepted. This implies, there is a significant agreement across the rankers of the constraints. The result was supported by the probability value of 0.000 which is less than 1% significance level.

In the result from Asante Akim South District, the Kendall's ranking technique showed high cost of inputs, inadequate supply of government inputs and pests and diseases as the three most pressing constraints identified by the respondents with mean scores 1.27, 2.41 and 2.71 respectively. The Kendall's W was 0.742 meaning there is 74.20% agreement among the rankers of the constraints. The chi-square calculated from the simulation was 867.776 and the chi-square obtained from the statistical table with 5% (0.05) significance level and 9 degrees of freedom was 16.919. The null hypothesis was not accepted because the chi-square calculated is greater than the chi-square critical. This implies there is a significant agreement among the rankers in the Asante Akim South District. This was confirmed by the probability value of 0.000 which is less than 1% significance levels.

From the Ahafo Ano South District, the Kendall's ranking technique exhibited high cost of inputs, pests and diseases and low purchase prices by LBCs as the top three leading constraints identified by the respondents with mean scores 1.27, 2.41 and 2.71 respectively. The Kendall's W was 0.577 meaning there is 57.70% agreement among the rankers of the constraints. The chi-square calculated was 675.360 and the chi-square critical at 5% significance level and 9 degrees of freedom was 16.919. The null hypothesis was not accepted. This is because the chi-square calculated was greater than the chi-square critical. This means that there is an agreement among the rankers of the constraints in the Ahafo Ano South District. A probability value of 0.000 which is less than 1% significance levels confirmed this conclusion.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusions and policy recommendations on the findings of this research work.

5.2 Summary

The study was conducted with the main objective of assessing the food security status and production constraints of cocoa farming households in the Ashanti Region of Ghana. The region being the second largest cocoa producing area in the country, the two leading cocoa selling districts in the region (Asante Akim South and Ahafo Ano South) were selected for the study. Four communities were then selected from both districts making total communities visited eight. Two hundred and sixty (260) cocoa farming households were selected and interviewed and food consumption data of 1750 individuals (household members) were recorded for analysis.

The study made use of descriptive analysis of data which indicates that majority (53.5%) of the household heads were aged between 40 to 59 years, which places them at a disadvantage since they cannot be considered for drafting and implementing long term policies and projects in the sector. The proportion of households that were headed by males was higher (75.4%) than those headed by females (24.6%). Most (54.2%) of the household heads in the study area had Junior High School or Middle School Leavers' Certificate of Education, 14.2% had up to primary education, 5% had Senior High School education and only 1.9% of them had education to the tertiary level. An important challenge facing the respondents was access to credit since majority of them (87.3%) were unable to receive any credit, 11.2% received credit for production, 0.8% had credit for household consumption and 0.8% received credit for other

uses. The respondents who did not belong to any cocoa farmers' co-operative were 63.8% whilst those who belong to a cocoa farmers' co-operative was 36.2%. Analysis of access to social amenities in the study area showed that 83.9% of the respondents had access to safe drinking water.

Food security indices were constructed in determining the food security status of the households in the study area using a recommended daily calorie intake of 2,900Kcal and 2,260Kcal. A household whose daily calorie intake was more or less than the recommended intake was grouped as either food secure or food insecure respectively. Statistical test was used to compare food security indices between households in the Asante Akim South and Ahafo Ano South districts. The indices compared are; Head Count Ratio (*HCR*), Food Insecurity Gap (FIG_i), Square Food Insecurity Gap ($SFIG_i$) and Surplus Index (*SI*). The indices (*HCR*, FIG_i , $SFIG_i$, *SI*) are mean figures.

Using the recommended daily calorie intake of 2900Kcal, it was revealed that 73% of the households were food secure and only 27% of them were food insecure. The t-test computed to compare the food security indices in the two districts showed that food insecurity was higher in Ahafo Ano South (14.04%) than Asante Akim South (13.80%). The food insecurity gap which measures the depth of food insecurity also showed that cocoa farming households in Ahafo Ano South consumed 28% less than their daily calorie requirement whilst those in the Asante Akim South consumed 26% less than their daily calorie requirement. The test of difference of means revealed that head count ratio (*HCR*) was statistically significant at 1% level. The rest of the indices that are, food insecurity gap (FIG_i), square food insecurity gap ($SFIG_i$) and surplus index (*SI*) were all not statistically significant.

The Logit regression used to estimate the determinants of food security status of cocoa farming households showed six (6) of the independent variables (age of household head, household

size, dependency ratio, own food production, adult working income and value of economic assets) to be statistically significant at 1%, 1%, 5%, 10%, 10% and 5% respectively. The variables, age of household head, household size and adult working income had a negative effect on the food security status of the households whilst dependency ratio, own food production and value of economic assets positively influenced food security of the households.

The ranking of food insecurity coping strategies revealed that, the widely used strategies in order of priority were; eating of less preferred food, borrowing money from cocoa purchasing clerks, maternal buffering, borrowing food and skipping meals. The less adopted strategies were food rationing, hunting and gathering, disposing off assets and traveling in search of jobs. The Kendall (W) which measures the agreement of the rankers was 0.615 with a chi-square value of 1279.617 and was statistically significant at 1% level.

To identify the food insecurity coping strategies adopted by respondents in the study area, literature was reviewed and a number of these coping strategies were identified, pre-tested among potential respondents for confirmation and presented to the actual respondents to rank. Kendall's coefficient of concordance was used to test the agreement among the rankers. Coping strategies were further used to estimate index of coping strategies used by cocoa farming households. The index of coping strategies used by cocoa farming households showed that few cocoa farming households (37%) practiced no strategy whilst majority (63%) were food insecure since they used one coping strategy or the other to mitigate food shortage. Among households who used coping strategies, medium index of coping strategies recorded the highest (33.08%) followed by low index (28.46%) and high index (1.15) being the lowest. Comparing the index of coping strategies between the two districts, it was revealed that the proportion of households who practiced no strategy was high in communities in Asante Akim South District (53.08%) than the communities of Ahafo Ano South District (21.54%).

In identifying and ranking of the production constraints of cocoa farmers, some constraints were identified from literature, pre-tested and presented to respondents to be ranked from the most pressing (1) to the least pressing (10). The study showed the most pressing constraints to cocoa production in order of rank to be; high cost of inputs, pest and diseases, inadequate supply of government inputs, low purchase price by LBCs and lack of capital. Other constraints ranked were low yield as a result of aged cocoa trees, high cost of labour, incidence of bush fires and poor rainfall pattern.

5.3 Conclusions

The conclusions from the study are as follows;

1. In establishing the food security status of the respondents' household using GSS/IFPRI (2000) standard of 2,900Kcal, it was observed that majority (73%) of the cocoa faming households were food secure. Cocoa farming households in the communities of Ahafo Ano South District are less food secure compared to their counterparts in the communities in Asante Akim South District. Again, the depth of food insecurity among respondents in the Ahafo Ano South District was higher than those in the Asante Akim South District and for that matter cocoa farming households in the former consume lower required daily calorie than households in the later.
2. Six variables: age of household head, household size, dependency ratio, own food production, adult working income and value of economic assets are the key determinants of the food security status of cocoa farming households. The number of members in households (household size) affects negatively the food security of households. This means that households with more members are more likely to be food insecure than those with fewer members.

3. An increase in the number of non-working (dependent) members in a household increases the level of food insecurity. This is because they add to the household size in contributing to more hands needed on the farms of the household to produce more food to meet the dietary requirement of the household.
4. Quantity of household own food production positively affects the food security status of households. This implies that when households increase the quantity of food produced from their own farm, the better they become in terms of food security.
5. The level of food insecurity in the Ahafo Ano South District was not that severe. Most of the food insecurity coping strategies used by cocoa farming households are moderate and only used to temporarily minimize the impact of food insecurity. The immediate coping strategies adopted by the cocoa farming households when faced with food shortages are eating less preferred food, borrowing money from cocoa purchasing clerks and maternal buffering (the practice where parents forgo their food to enable their children have enough when there was insufficient food in the house or not enough money to buy food).
6. A higher proportion of cocoa farming households in the Ahafo Ano South District adopted food insecurity coping strategies than those in the Asante Akim South District. This implies that food insecurity was higher in the communities in the former than the latter.
7. Cocoa farmers (household heads) in the study area were found to be averagely advanced in age and cannot be relied on for any strategic (long term) agricultural improvement programmes.
8. Majority of the respondents have access to semi-treated water from boreholes but do not further treat the water to make it safe for drinking and using for household consumption.

9. The amount of income contributed to the household by its working adult members had a negative effect on the food security of the household. This could be possible if monies contributed by the working members are diverted to other areas either than consumption purposes of the household.
10. The most widely used food insecurity coping strategies in order of priority were; eating of less preferred food, borrowing money from cocoa purchasing clerks and maternal buffering.
11. The most pressing cocoa production constraints encountered by the households were high cost of inputs, pest and diseases and inadequate supply of government inputs.

5.4 Recommendations

Based on the findings and conclusions of the study, the following policy recommendations are made;

1. Government should broaden the pro-poor policies such as Livelihood Empowerment Against Poverty (LEAP) and School Feeding Programme to cover food insecure households especially those in the Ahafo Ano South District.
2. More agricultural and cocoa extension officers should be employed in augmenting the work of the existing ones that is intensifying the education given to famers on good agricultural practices so as to improve their yield which will ultimately affect positively their income.
3. Priority should be given to the cocoa farming households in the Ahafo Ano South District in terms of formulation and implementation of the pro-poor policies of governments such as free uniforms, exercise books, LEAP and National Health Insurance Scheme (NHIS) as a means to bridge the food and poverty gap between the two districts of the study (Asante Akim South and Ahafo Ano South).

4. Cocoa farmers should be educated on the pros and cons of using untreated water which directly affects their health conditions. They should be educated on the usefulness of some simple indigenous ways of treating their drinking water such as filtering and boiling.
5. Agricultural interventions focused on the cocoa sector such as fertilizers, pesticides and weedicides should be delivered in their right quantities needed to attain expected cocoa yield. Again, timely delivery of these inputs to the farmers is of essence since its usefulness in achieving the original goal of government in increasing the output of cocoa largely depends on it. Most fertilizers and other chemicals aimed at helping the production of cocoa are best utilized in the raining seasons.
6. Food insecurity coping strategies adopted by the cocoa farming households have short term effects. Therefore, Extension Officers are to intensify education to farmers on the need to expand farm sizes and also improve on access to other income generating activities that are more sustainable.
7. NGOs and other governmental agencies who intend to provide relief to the study area should target the months during which food shortages are severe (June to August). Food supplements such as vitamin E400 could be given to the children under the age of two years to avert the effects of malnutrition caused by food insecurity.

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APPENDICES

Appendix 1 - Sample Questionnaire

University of Ghana
Department of Agricultural Economics and Agribusiness

This research work is to be conducted in partial fulfillment of a master's degree and for that matter any information provided will not be disclosed to any third party. It will be used solely for the purpose of analysis in this research only and will be treated with the highest confidentiality it deserves.

QUESTIONNAIRE ON ASSESSING FOOD SECURITY STATUS AND PRODUCTION CONSTRAINTS OF COCOA FARMING HOUSEHOLDS IN THE ASHANTI REGION

Name of Interviewer:	
Questionnaire No.:	**Date:**
Community/Village:	**District:**

SECTION A

PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS

1. Name of respondent (Head of Household): _____
2. Are you the owner of the cocoa farm? 1) Yes [ ] 2) No [ ]
3. If No, what is your relationship with the owner? _____
4. Marital Status: 1) Married [ ] 2) Single [ ] 3) Seperated/Divorced [ ]
   4) Widowed [ ] 5) Other (Specify)
   _____
5. Gender: 1) Male [ ] 2) Female [ ]
6. Age (Head of Household): _____
7. Ethnicity: 1) Akan [ ] 2) Ga [ ] 3) Ewe [ ] 4) Others [ ] (Specify) _____
8. Religion: 1) Christian [ ] 2) Islamic [ ] 3) Traditionalist [ ] 4) Others (Specify)
9. Household size *(Number of individuals in your household)*: _____
10. Number of children: 1) Under 6 years: _____ 2) Between 6 – 18 years: _____
    3) Above 18 years: _____ 4) Schooling: _____ 5) Working: _____
11. Level of highest education of household head. 1) None [ ] 2) Primary [ ] 3)
    JHS/MSLC [ ] 4) SSCE/O/A Level [ ] 5) Tertiary [ ] 6) Others [ ] (Specify):

12. Number of years in school:_____

13. What is the variety of cocoa you cultivate? 1) Improved [ ] 2) Unimproved [ ]

14. How many cocoa farms do you cultivate? _____

15. What is/are the size(s) of your cocoa farm(s)? _____

16. What is/are the output of your cocoa farm(s) last season?

    Main crop *(Oct – May)*: _____ Light crop *(Jun – Sept)*: _____

17. How old is/are your cocoa farm(s)? _____

18. Have you replaced any of your cocoa trees in the last five years? 1) Yes [ ] 2) No [ ]

19. If Yes, which year was that? _____

20. What size of farm was replaced? _____ (ha)

21. Do you have access to readily available labour for farm work? 1) Yes [ ] 2) No [ ]

22. How many people/labour are engaged in your cocoa farming activities? _____

23. What is the labour available for farm work in hours per day? _____

24. Indicate and rank the type of other agricultural activities you are engaged in and farm size apart from your cocoa farm.

Farming activity	**Tick ✓**	**Farm size (Ha)**	**Production (MT)**	**Rank (Value)**
Food crop;				
Maize				
Cassava				
Yam				
Plantain				
Other(s) (Specify)				
Cash crop;				
Palm plantation				
Other(s) (Specify)				
Livestock;		**Herd Size**	**Off Take Rate**	
Cattle				
Sheep				
Goat				
Poultry				

SECTION B

INCOME GENERATION

25. What is/are the source(s) of your household income in 2015?

Source	**Tick ✓**	**Unit of measurement**	**Amount (GH¢)**	**Amount per year (GH¢)**
*Cocoa farm proceeds				
Major Season		Bags (64 kg) Sold:_____		
Minor Season		Bags (64 kg) Sold:_____		
*Other farming activities;				
Weeding contracts		Per week		
Cutting firewood for sale		Per week		
Hunting		Per week		
Sale of farm produce		Per week		
*Off-farm activities;				
Petty trading		Per week		
Part-time jobs		Per week		
*Remittances		Per month		
*Adult working member(s)		Per month		
*Other(s)				
Total Annual Income				

NB: *Multiply weekly incomes by 52 and monthly incomes by 12 to obtain Amount per year.*

SECTION C

VALUE OF ECONOMIC ASSETS OF HOUSEHOLD

26. What are the assets of the household head? Please tick appropriately.

Asset	**Tick ✓**	**Current Qty**	**Unit Price (GH¢)**	**Qty Sold (2015)**	**Value (GH¢)**	
					Sold	**Remaining**
Cutlass						
Hoe						
Cattle						
Sheep						
Goat						
Pig						
Poultry						
Woodlot						

Television set						
Radio						
Fridge/freezer						
Furniture						
Bicycle/Motor cycle						
Car						
Mobile phone						
Land						
House						
Electric fan						
DVD player						
Sewing machine						
Savings						
Investments						
Others (*specify)*						
Others *(specify)*						

SECTION D

FOOD SECURITY AND COPING STRATEGIES

27. In the past twelve (12) months, was there a day you did not have your preferred food to consume? 1) Yes [ ] 2) No [ ]

28. If Yes, which of the following month(s) did you experience this?

Month	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*
Tick												

29. Which days did this happen?

_____

30. In the past thirty (30) days, was there a day you did not have enough food in the house or money to buy some? 1) Yes [ ] 2) No [ ]

31. How d0 you cope or minimize the impact of food shortage in your house?

No.	**Coping strategy**	✓ **Tick**	**Freq./ month**	**Rank**
01	Eating foods that are less preferred			
02	Reducing amount of food consumed (rationing)			
03	Borrowing food			
04	Maternal buffering (mother reducing her food intake to enable children have enough)			

05	Skipping meal within a day			
06	Borrowing money to buy food			
07	Collecting food from the wild or garden			
08	Disposing of assets to get money for food			
09	Travel to search for jobs			
10	Others (specify below)			

SECTION E

FOOD AVAILABILITY/ACCESSIBILITY

32. How long does the household's harvested staple food for consumption last?

_____ (days)

33. What is the quantity of own food production and sales in the 2015 cropping season?

Crop	**Own food production**		**Sale of food produced**		
	Major Season (kg/bags)	***Minor Season (kg/bags)***	***Qty***	***Unit Price***	***Amount GH¢***
Maize					
Cassava					
Rice					
Plantain					
Yam					
Taro					
Vegetables					
Others (specify)					
Total					

34. What quantity of food did you buy to meet households' needs (monthly)?

Month	**Maize**		**Cassava**		**Rice**		**Plantain**		**Yam**		**Vegetable**	
	Qty	Pr.	Qty	Pr.	Qty	Pr.	Qty	Pr.	Qty	Pr.	Qty	Pr.
Jan												
Feb												
Mar												
Apr												
May												
Jun												

Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
Total												

35. What amount of food does the household consume in a week?

Crop	**Own farm (Qty/kg/bag)**	**Purchased (Qty/kg/bag)**	**Gift/borrowed (Qty/kg/bag)**	**Gifts to others (Qty/kg/bag)**
Maize				
Cassava				
Plantain				
Yam				
Rice				
Fruits				
Vegetables				
Meat/Fish				
Others (Specify)				

SECTION F

ACCESS TO CREDIT

36. Did you have access to credit in the last cropping year? 1) Yes [ ] 2) No [ ]
37. If yes, which kind of credit did you go for? 1) Production credit [ ] 2) Consumption credit [ ] 3) Other [ ] (specify) _____
38. What is the size of the credit (as a proportion of total production cost)?
    GH¢_____
39. Did you have the credit on time? 1) Yes [ ] 2) No [ ]
40. If No, what hindered your access to credit? _____
    _____
41. What was the effect of this credit on your activities and output? _____
    _____
    _____

42. What is the total cost of production for the 2015 season (cocoa only)?
    GH¢_____

SECTION G

ACCESS TO UTILITIES AND CONSTRAINTS

43. Were you prevented from performing your normal farm duties due to ill health in the last year? 1) Yes [ ] 2) No [ ]
44. Do you have access to health care? 1) Yes [ ] 2) No [ ]
45. How many man-days were lost to ill health by the household?
    _____
46. What is the major source of water to your household for domestic use? 1) Pipe borne water [ ] 2) River/stream [ ] 3) Borehole [ ] 4) Hand dug well [ ]
    5) Others (specify) _____
47. If not pipe borne water, how do you treat the water before drinking? _____
    _____
48. Do you have access to electricity in your community? 1) Yes [ ] 2) No [ ]
49. If Yes, is your house connected to electricity? 1) Yes [ ] 2) No [ ]
50. If No in (Q.48), what are the reasons for your houses not being connected? _____
    _____
51. Do you have access to any mobile telecommunication network in your community?
    1) Yes [ ] 2) No [ ]
52. Do you belong to any association or cooperative? 1) Yes [ ] 2) No [ ]
53. If Yes, which association/cooperative? _____
54. Did you receive any extension service during the last cropping year?
    1) Yes [ ] 2) No [ ]
55. What are the challenges you encounter as a cocoa farmer in your production?

No.	**Challenges/Constraints**	**Tick ✓**	**Rank**
1.	High cost of inputs		
2.	Inadequate supply of government inputs		
3.	Pests and diseases		
4.	Aging cocoa trees causing low yields		
5.	Low purchase price		
6.	High cost of labour		

7.	Lack of capital		
8.	Poor rainfall		
9.	Theft of produce		
10.	Incidence of bush fire		

For Interviewer

General Observation(s): _____

_____

_____

_____

_____

Phone Number: _____ Signature: _____

Phone Number (Respondent): _____

Thank you for your time.

Appendix 2 - FSI Results for households in Asante Akim South District (2900Kcal)

Respondent	FSI	Respondent	FSI	Respondent	FSI	Respondent	FSI
1.	1.70	34.	1.02	67.	1.61	100.	1.50
2.	1.05	35.	0.41	68.	2.87	101.	3.28
3.	1.28	36.	0.95	69.	3.37	102.	1.23
4.	2.42	37.	1.07	70.	1.03	103.	1.83
5.	1.44	38.	1.08	71.	1.26	104.	1.39
6.	1.27	39.	5.14	72.	2.10	105.	1.23
7.	1.29	40.	0.87	73.	3.63	106.	1.55
8.	1.30	41.	4.21	74.	1.76	107.	1.05
9.	1.86	42.	4.75	75.	1.76	108.	1.51
10.	4.26	43.	1.09	76.	1.62	109.	3.78
11.	11.58	44.	1.70	77.	1.12	110.	1.96
12.	0.82	45.	1.16	78.	2.85	111.	1.51
13.	2.74	46.	1.08	79.	1.78	112.	1.51
14.	1.76	47.	1.51	80.	1.69	113.	1.28
15.	0.84	48.	2.24	81.	1.38	114.	3.74
16.	1.80	49.	1.56	82.	0.92	115.	1.49
17.	0.72	50.	2.18	83.	0.53	116.	1.73
18.	1.99	51.	0.55	84.	0.78	117.	0.84
19.	3.30	52.	1.44	85.	0.48	118.	2.73
20.	1.65	53.	0.76	86.	1.51	119.	0.48
21.	1.45	54.	1.27	87.	0.68	120.	4.36
22.	1.25	55.	0.80	88.	1.15	121.	3.10
23.	0.95	56.	0.73	89.	1.32	122.	4.18
24.	1.48	57.	6.19	90.	0.79	123.	0.81
25.	1.04	58.	0.44	91.	1.91	124.	3.27
26.	2.08	59.	1.45	92.	2.14	125.	2.63
27.	2.26	60.	5.61	93.	1.81	126.	1.30
28.	1.45	61.	1.54	94.	1.29	127.	1.40
29.	2.26	62.	1.17	95.	1.45	128.	3.10
30.	5.35	63.	5.39	96.	0.94	129.	2.48
31.	0.94	64.	2.16	97.	14.94	130.	1.69
32.	2.18	65.	1.63	98.	2.32		
33.	3.44	66.	1.44	99.	0.57		

Appendix 3 - FSI Results for households in Ahafo Ano South District (2900Kcal)

Respondent	FSI	Respondent	FSI	Respondent	FSI	Respondent	FSI
131.	1.19	164.	0.44	197.	0.98	230.	0.99
132.	1.49	165.	2.27	198.	1.59	231.	1.54
133.	1.79	166.	0.53	199.	1.95	232.	1.93
134.	1.24	167.	1.63	200.	0.81	233.	4.90
135.	2.68	168.	1.10	201.	1.13	234.	1.34
136.	1.26	169.	0.40	202.	4.73	235.	0.87
137.	1.38	170.	1.39	203.	0.78	236.	1.30
138.	2.15	171.	2.77	204.	1.83	237.	0.86
139.	1.23	172.	4.90	205.	0.32	238.	0.93
140.	6.66	173.	1.58	206.	0.59	239.	1.13
141.	0.77	174.	1.36	207.	2.14	240.	0.50
142.	2.35	175.	1.56	208.	1.24	241.	0.60
143.	1.26	176.	0.98	209.	0.94	242.	1.56
144.	5.34	177.	1.24	210.	1.32	243.	1.99
145.	1.79	178.	0.94	211.	0.32	244.	0.90
146.	1.55	179.	1.13	212.	0.76	245.	1.41
147.	1.03	180.	0.95	213.	1.49	246.	0.73
148.	1.75	181.	0.74	214.	1.13	247.	0.77
149.	1.15	182.	0.79	215.	0.82	248.	0.76
150.	2.60	183.	1.94	216.	0.75	249.	2.39
151.	8.76	184.	1.87	217.	6.01	250.	0.48
152.	0.71	185.	2.49	218.	0.55	251.	2.88
153.	3.07	186.	0.42	219.	1.49	252.	0.52
154.	0.85	187.	1.01	220.	3.37	253.	2.18
155.	2.33	188.	0.94	221.	0.85	254.	1.27
156.	2.27	189.	1.06	222.	0.73	255.	1.12
157.	1.20	190.	6.18	223.	1.39	256.	1.61
158.	0.95	191.	1.55	224.	0.65	257.	1.30
159.	1.01	192.	0.80	225.	0.51	258.	2.25
160.	3.61	193.	1.24	226.	0.69	259.	1.87
161.	2.25	194.	1.15	227.	5.66	260.	0.75
162.	1.10	195.	0.47	228.	3.77		
163.	1.32	196.	5.84	229.	0.61		

Appendix 4 - Logit Regression Results using STATA (Overall Model)

```
Iteration 0:   log likelihood = -152.43677
Iteration 1:   log likelihood = -115.52352
Iteration 2:   log likelihood = -113.43009
Iteration 3:   log likelihood = -113.41702
Iteration 4:   log likelihood = -113.41701

Logistic regression                                     Number of obs   =        260
                                                        LR chi2(12)     =      78.04
                                                        Prob > chi2     =     0.0000
Log likelihood = -113.41701                             Pseudo R2       =     0.2560
```

FSS_GSS	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Q6_age	-.0393602	.0148436	-2.65	0.008	-.0684532	-.0102672
Q12_eduy	-.0455229	.0429877	-1.06	0.290	-.1297772	.0387314
Q9_hhsiz	-.4157506	.0698026	-5.96	0.000	-.5525611	-.27894
DepRatio	.2877079	.1386685	2.07	0.038	.0159226	.5594931
Q17_ageo	-.0171184	.0219721	-0.78	0.436	-.060183	.0259462
Q36_acs2	.3959551	.5515162	0.72	0.473	-.6849968	1.476907
FoodProd	.0000231	.0000135	1.71	0.087	-3.34e-06	.0000496
COI	-.000033	.0000343	-0.96	0.336	-.0001003	.0000342
OFE	-.0000442	.0001382	-0.32	0.749	-.000315	.0002266
REM	.0002115	.0001845	1.15	0.252	-.0001501	.0005731
AWI	-.000672	.0003935	-1.71	0.088	-.0014432	.0000993
Assets	.0000532	.0000247	2.15	0.031	4.80e-06	.0001016
_cons	5.964594	1.053341	5.66	0.000	3.900084	8.029104

```
. mfx

Marginal effects after logit
      y  = Pr(FSS_GSS) (predict)
         =  .79024021
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Q6_age	-.0065244	.00243	-2.68	0.007	-.011288	-.001761	51.4154
Q12_eduy	-.0075459	.00708	-1.07	0.287	-.021432	.00634	6.62692
Q9_hhsiz	-.0689151	.0116	-5.94	0.000	-.091659	-.046171	6.66154
DepRatio	.0476906	.02296	2.08	0.038	.002682	.0927	2.42041
Q17_ageo	-.0028376	.00364	-0.78	0.435	-.009965	.00429	11.5538
Q36_acs2*	.0600638	.07604	0.79	0.430	-.088978	.209106	.126923
FoodProd	3.84e-06	.00000	1.72	0.086	-5.5e-07	8.2e-06	12053.2
COI	-5.48e-06	.00001	-0.96	0.336	-.000017	5.7e-06	5331.31
OFE	-7.33e-06	.00002	-0.32	0.749	-.000052	.000038	686.862
REM	.0000351	.00003	1.16	0.246	-.000024	.000094	414.462
AWI	-.0001114	.00007	-1.70	0.088	-.00024	.000017	958.654
Assets	8.82e-06	.00000	2.18	0.029	9.0e-07	.000017	7368.71

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 5 - Logit Regression Results using STATA (Asante Akim South District)

```
Iteration 0:   log likelihood = -63.641746
Iteration 1:   log likelihood = -48.627109
Iteration 2:   log likelihood = -46.730367
Iteration 3:   log likelihood = -46.590143
Iteration 4:   log likelihood = -46.582151
Iteration 5:   log likelihood = -46.582126
Iteration 6:   log likelihood = -46.582126

Logistic regression                               Number of obs   =        130
                                                  LR chi2(12)     =      34.12
                                                  Prob > chi2     =     0.0006
Log likelihood = -46.582126                       Pseudo R2       =     0.2681
```

FSS_GSS	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Q6_age	-.0531414	.0247704	-2.15	0.032	-.1016905	-.0045924
Q12_eduy	-.0396312	.065714	-0.60	0.546	-.1684284	.0891659
Q9_hhsiz	-.4466769	.1117609	-4.00	0.000	-.6657243	-.2276295
DepRatio	.2476013	.2283769	1.08	0.278	-.2000093	.6952119
Q17_ageo	.0309453	.0468105	0.66	0.509	-.0608016	.1226922
Q36_acs2	-.1270433	.7112187	-0.18	0.858	-1.521006	1.26692
FoodProd	-4.45e-07	.0000184	-0.02	0.981	-.0000366	.0000357
COI	-.0000244	.0000471	-0.52	0.605	-.0001167	.000068
OFE	-.0000266	.0002096	-0.13	0.899	-.0004374	.0003842
REM	.0005628	.0006852	0.82	0.411	-.0007802	.0019059
AWI	.0008885	.0012367	0.72	0.472	-.0015353	.0033124
Assets	.0000463	.0000359	1.29	0.197	-.000024	.0001166
_cons	5.807063	1.80717	3.21	0.001	2.265076	9.34905

```
. mfx

Marginal effects after logit
      y  = Pr(FSS_GSS) (predict)
         =  .88637031
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Q6_age	-.0053523	.00261	-2.05	0.041	-.010474	-.00023	48.0615
Q12_eduy	-.0039916	.00667	-0.60	0.549	-.017059	.009076	6.8
Q9_hhsiz	-.0449884	.01462	-3.08	0.002	-.073635	-.016342	6.57692
DepRatio	.0249379	.02366	1.05	0.292	-.021441	.071317	2.37238
Q17_ageo	.0031168	.00476	0.65	0.513	-.006211	.012445	9.64615
Q36_acs2*	-.0131991	.07602	-0.17	0.862	-.16219	.135792	.184615
FoodProd	-4.48e-08	.00000	-0.02	0.981	-3.7e-06	3.6e-06	11496.4
COI	-2.45e-06	.00000	-0.51	0.607	-.000012	6.9e-06	6242.83
OFE	-2.68e-06	.00002	-0.13	0.899	-.000044	.000039	654.923
REM	.0000567	.00006	0.94	0.346	-.000061	.000175	410.769
AWI	.0000895	.00013	0.71	0.476	-.000157	.000336	792.692
Assets	4.66e-06	.00000	1.28	0.200	-2.5e-06	.000012	8318.96

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 6 - Logit Regression Results using STATA (Ahafo Ano South District)

```
Iteration 0:   log likelihood = -84.473363
Iteration 1:   log likelihood = -60.901953
Iteration 2:   log likelihood = -60.175334
Iteration 3:   log likelihood = -60.167572
Iteration 4:   log likelihood = -60.167568

Logistic regression                               Number of obs   =        130
                                                  LR chi2(12)     =      48.61
                                                  Prob > chi2     =     0.0000
Log likelihood = -60.167568                       Pseudo R2       =     0.2877
```

FSS_GSS	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Q6_age	-.0346962	.0218819	-1.59	0.113	-.0775839	.0081914
Q12_eduy	-.0614517	.0672495	-0.91	0.361	-.1932582	.0703549
Q9_hhsiz	-.3851421	.0993381	-3.88	0.000	-.5798413	-.190443
DepRatio	.3768553	.1919019	1.96	0.050	.0007346	.7529761
Q17_ageo	-.0174561	.0271322	-0.64	0.520	-.0706342	.0357219
Q36_acs2	1.477495	1.07437	1.38	0.169	-.6282318	3.583221
FoodProd	.000052	.0000224	2.32	0.020	8.14e-06	.000096
COI	-.0001361	.0000648	-2.10	0.036	-.0002631	-9.00e-06
OFE	-.0000797	.0002064	-0.39	0.699	-.0004842	.0003248
REM	.0002002	.0002207	0.91	0.364	-.0002323	.0006327
AWI	-.0010328	.0007179	-1.44	0.150	-.0024398	.0003743
Assets	.0000693	.0000393	1.76	0.078	-7.72e-06	.0001463
_cons	5.581899	1.618893	3.45	0.001	2.408928	8.754871

```
. mfx

Marginal effects after logit
      y  = Pr(FSS_GSS) (predict)
         =  .70037179
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Q6_age	-.007281	.00457	-1.59	0.111	-.016239	.001677	54.7692
Q12_eduy	-.0128957	.01396	-0.92	0.356	-.040261	.014469	6.45385
Q9_hhsiz	-.0808225	.02108	-3.83	0.000	-.122138	-.039507	6.74615
DepRatio	.0790835	.03955	2.00	0.046	.001568	.156599	2.46844
Q17_ageo	-.0036632	.00569	-0.64	0.520	-.014812	.007485	13.4615
Q36_acs2*	.2239315	.10416	2.15	0.032	.019776	.428087	.069231
FoodProd	.0000109	.00000	2.41	0.016	2.0e-06	.00002	12610
COI	-.0000286	.00001	-2.12	0.034	-.000055	-2.1e-06	4419.79
OFE	-.0000167	.00004	-0.39	0.699	-.000102	.000068	718.8
REM	.000042	.00005	0.91	0.364	-.000049	.000133	418.154
AWI	-.0002167	.00015	-1.41	0.159	-.000518	.000085	1124.62
Assets	.0000145	.00001	1.77	0.077	-1.6e-06	.000031	6418.45

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 7 - How household food consumption was ascertained

To ascertain the quantity of food households consumed daily, the major staple foods consumed by households in the study area was identified and confirmed by pretesting the sample questionnaire.

- The various tools and materials for food measurement was then determined for the various staple foods thus baskets, sack, pan, 'paint rubber' and 'olonka'.
- Full measures of the various food items in their respective measuring materials are weighed on a food scale and recorded in kilograms. For instance, a 'paint rubber' full of milled maize (corn dough) is placed on a food scale to get the weight.
- The average weights of food stuffs like yam, plantain and cassava in the various districts where applicable were obtained with the help of the Agriculture officers of the MoFA in districts visited.
- On the other hand, in ascertaining the weights of the fruits and vegetables consumed by the household, the commonly used vegetables and fruits were mixed and put in their appropriate measure materials and weighed. For example, typical household in the study area would use tomato, pepper, garden eggs and spinach each day, so these vegetables are collected in equal proportions and weighed on the food scale in a basket or paint rubber based on the consumption level of the household.
- Meat and fish consumption by the households were recorded in monetary value and later with data from the GSS converted to their respective quantities.
- In gathering the field data, households were asked the quantity of the staple foods (maize, yam, cassava, rice and plantain) consumed in a week using the earlier listed localized means of measurement (baskets, sacks, pan, 'paint rubber' and 'olonka').
- In recording the consumption of plantain, cocoa farming households were asked the type of plantain they consumed within the week and the number of bunches or fingers

they consumed within the week. These details were recorded and the weights were compared with the district and regional data of GSS to arrive at a standardized unit to be used for analysis.

- For rice, they were asked the number of cups, 'olonka', 'paint rubber' or bag used per week. The weight of the 'olonka' was obtained as 2.5kg and 6 cups make one 'olonka'. The weight of bags of milled rice ranges from 5kg, 25kg and 50kg depending on the size of the bag.
- Finally, the total quantity of food consumed in kilograms were summed up which represents the weekly consumption of the households. In arriving at the daily calorie intake, the total weekly consumption was simply divided by the seven and then the various food items converted to their equivalent calorie (Kcal) content using the conversion table as compiled by Tayie and Lartey (2008).
- It was observed that, there was no sharp contrast in the consumption patterns of the cocoa farming households in the two districts. This could be that their ecological zones are not so different and for that matter their taste and preference for food are the same.

Reference

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Appendix 8 - Matrix of Objectives, Methodology, Key findings, Implications and Recommendations

Topic: Assessing the food security status and production constraints of the cocoa farming households in the Ashanti Region.

Objective	Methodology	Key Findings	Implications	Recommendation
1. To determine the food security status of cocoa farming households in the study area.	FSI using 2,900kcal (GSS/IFPRI) and 2,260kcal (FAO) standards. $Z_i = \frac{Y_i}{R_i}$ FSI ≥ 1, food secure FSI < 1, food insecure	73% of the households were food secure whilst only 27% were food insecure using the recommended daily calorie intake of 2,900kcal.	This implies that cocoa farming households in the study area are predominantly food secure.	Though households may be food secure but this might not be sustainable so government and other non-governmental agencies could step in and educate cocoa farmers and equip them with skills on alternative ways of generating income to sustain household consumption.
2. To estimate the determinants of food security status of the cocoa producing households.	Logistic regression model in the form; $Z_i = \alpha + \sum_{i-1}^{n} \beta_i x_i + \varepsilon_i$	*The key determinants of food security status were age, household size, dependency ratio, own food production, adult working income and value of economic assets. *All key determinants met their a priori expectations except with dependency ratio and adult working income.	If the number of non-working members (dependents) of the household increases it affects negatively their food security due to the increase in food demand. The quantity of household's own food production have a positive relationship with their food security status which implies that the more cocoa farming households produce their own food crops the higher their probability of being food secure.	Household heads should be educated on the usefulness of planning the size of their families since large family size have a higher tendency of producing more non-working members which in turn affects negatively their food security. Back yard farming should be encouraged among the cocoa farmers by the extension officers since higher volumes of food crops yields better chances of being food secure.

3. To estimate and compare food security indices of cocoa farming households in two districts in the Region.	T-test was employed in comparing the food security indices (*HCR, FIG_i $SFIG_i$ SI*) across communities in the two districts (Asante Akim South and Ahafo Ano South)	Head count ratio (*HCR*) was significant statistically at 1% level	More households in Ahafo Ano were food insecure as compared to Asante Akim. Food insecure households in Ahafo Ano require an additional 28% more food to become food secure whilst those in Asante Akim require 26% more of what they consumed to meet the threshold of food security.	Priority should be given to the cocoa farming households in the Ahafo Ano South District in terms of formulation and implementation of the pro-poor policies of governments such as free uniforms, exercise books, LEAP and National Health Insurance Scheme (NHIS) as a means to bridge the food and poverty gap.
4. To estimate and compare the index of coping strategies adopted by cocoa farming households in the two districts of the study area.	Index of coping strategies was used to categorize households into no strategy, low, medium and high strategies.	37% of the cocoa farming households practiced no strategy, 28% used low index, 33% used medium index and only 1% used high index strategies.	Due to the food secure nature of majority of the households in the study area they did not in most occasions make use of coping strategies. On the other hand, some of them made use of coping strategies which shows a likely tendency of the households being food insecure some time to come.	Food insecurity coping strategies adopted by the cocoa farming households have short term effects. Therefore, there is the need to expand farm size and also improve on access to income generating activities that are more sustainable and can mitigate the occurrence of food insecurity in the future.
5. To identify, rank and analyze the constraints of cocoa production of the cocoa farming households.	Kendall's W was used to test the agreement of the rankings by the respondents. $W = \frac{12S' - 3p^2 n(n+1)^2}{p^2(n^3 - n) - pT}$	The most pressing constraints to cocoa production were; high cost of inputs, pest and diseases and inadequate supply of government inputs	Cocoa farmers cannot afford the chemicals and other inputs which are very important in getting high yields. The absence of the government subsidies (inputs) in the form of inputs also inhibits the productivity of farmers.	Government subsidies on inputs such as fertilizers, pesticides and weedicides should be delivered to the farmers on time. Most fertilizers and other chemicals aimed at helping the production of cocoa are best utilized in the raining seasons.

Appendix 9 - Plagiarism Report

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