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**MASTER THESIS**

**HOUSEHOLD SOCIO-ECONOMIC CHARACTERISTICS AND FOOD SECURITY**

**OF SMALL SCALE FARMERS IN THE NANUMBA NORTH DISTRICT OF**

**GHANA**

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# ACKNOWLEDGEMENT

## DEDICATION

I dedicate this work to my parents: Mr. Michael Kofi Otoo and Mrs. Elizabeth Salamatu Otoo with love.

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## LIST OF ABBREVIATION AND ACRONYMS

| | |
|---|---|
| CFSVA | Comprehensive Food Security and Vulnerability analysis |
| CSO | Civil Society Organisation |
| FAO | Food and Agricultural Organisation |
| FASDEP | Food and Agriculture Sector Development Policy |
| FBO | Farmer Based Organisations |
| GLSS | Ghana Living Standard Survey |
| GSS | Ghana Statistical Service |
| HFSSM | Household Food Security Survey Module (HFSSM |
| HH | Households |
| HHH | Household Head |
| IFAD | International Fund for Agricultural Development |
| OHCHR | United Nations High Commissioner for Human Rights |
| MDG | Millennium Development Goals |
| NGO | Non-Governmental Organisation |
| MoFA | Ministry of Food and Agriculture |
| UN | United Nations |
| UNGA | United Nations General Assembly |
| WFP | World Food Programme |

# ABSTRACT

This study examines the household socio-economic characteristics and food security status of small-scale farmers in the Nanumba North District of Ghana. 150 households were sampled for this study from five communities in the Nanumba North district of Ghana. The multi-stage sampling technique was employed to select the households. The data obtained was analysed using the Household Food Security Survey Module (HFSSM), the Binary Logit Regression Model and the Garret ranking technique. The study identified that 58% of the small-scale farm households were food secure while 42% were food insecure. Estimates from the binary logit model showed that having access to credit increases a farm household's probability of being food secure. It further identified unfavourable climate to be the most important food security constraint for farm households. Purchasing cheaper food was also identified as the most relevant food security coping strategy used or likely to be used by farm households. The outcome of the study has policy implications for food security programmes focused on rural agricultural households.

Keywords: coping strategies, constraints, farm household, food security, Ghana

## ABSTRAKT

Tato studie se zabývá socio-ekonomickými charakteristikami domácností a zabezpeèováním potravin u drobných zemìdìlcù v okrese Nanumba North District v Ghanì. Vzorky pro tuto studii byly odebírány ze 150 domácností v pìti obcích v okrese Nanumba North District v Ghanì. Pro rozdìlení domácností byla využita technika vícestupòového vzorkování. Získaná data byla analyzována pomocí modelù Household Food Security Survey Module (HFSSM), binární logistické regrese a øadící technikou Garret. Studie zjistila, že v produkci potravin je 58 % drobných zemìdìlských domácností sobìstaèných, zbylých 42 % je nesobìstaèných. Odhady z modelu ukázaly, že možnost získat úvìr zvyšuje pravdìpodobnost, že farmáøská domácnost bude sobìstaèná. Dále bylo ze studie zjištìno, že nepøíznivé klima je nejzásadnìjší pøekážkou k zajištìní sobìstaènosti tìchto domácností. Poøizování levnìjších potravin bylo zjištìno jako strategie zajištìní potravin, která je a mohla by být využívána. Výsledkem této studie je možné øešení situace pomocí programù, které jsou soustøedìny na venkovské zemìdìlské domácnosti.

Klíèová slova: copingová strategie, omezení, farmáøská domácnost, zajištìní potravin, Ghana

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<h1 style="text-align:center">CHAPTER ONE: INTRODUCTION</h1>

## 1.0 Background

Chapter one discusses the concept of food security and food security in Ghana. It further identifies the research questions, outlines the objectives, the relevance of the study and the organisation of chapters for the study.

## 1.1 Introduction to the concept of Food security

Concerns about the ability of resources to support the growth of human society have attracted the attention of scholars since ancient times. In the 19th Century, Malthus' Essay on the *Principle of Population* gave new impetus to this subject. Scholars have argued out the capacity of natural resources to support the growing human population with some drawing attention to the likelihood of a Malthusian catastrophe. Food remains a basic human need. The ability to provide food for the population is not an issue many developed regions of the world. However, this continues to be a major challenge for many developing countries.

Despite the fact that a global food catastrophe remains groundless and the prevalence of undernourishment decreased from 18.6% in 1990-92 to 10.9% in 2014-16 in face of a growing global population, there are still an unacceptable large number of people lacking the food they need for an active and healthy life (FAO, IFAD & WFP, 2015; Rosegrant & Cline, 2003). The effort at addressing concerns of hunger and food insecurity globally received recognition at the World Food Summit (1996) with the Rome Declaration on World Food Security. At this summit world leaders pledged to eradicate hunger globally and reduce the total number of undernourished individuals by half by 2015 (FAO, 1999).

In the year 2000, world leaders under the leadership of the United Nations (UN) instituted the Millennium Development Goals (MDG), an ambitious programme to reduce poverty and improve lives, especially in the developing world. One of the targets of the first goal (MDG 1 - Eradicate poverty and extreme hunger) sought to reduce the proportion of people suffering from hunger by 2015 (United Nations General Assembly [UNGA], 2000).

Lang and Heasman (2015) identify that concerns about the vulnerability of food supplies received new impetus with the world commodity price crisis (2007-8). This increased the debate regarding the means to address world food supply concerns with technological

solutions being promoted from some quarters while others offer the argument that there is adequate food but it is poorly distributed and or wasted.

FAO *et al.* (2015) and United Nations (UN, 2015) recent estimate suggest that about 795 million people in the world were undernourished in 2014–16, that is over one in nine people, with the majority of the hungry living in developing countries. The Prevalence of Undernourishment in the developing regions of the world is estimated at 780 million people (12.9%; 2014–16), representing a 44.5% reduction from 1990-92 estimates. Despite these achievements, there are still concerns about the inability of many households especially in the developing world to secure enough food for household use.

## 1.2 Problem Statement

FAO *et al.*, (2015) cite Ghana as one of the early success stories in the global fight against hunger. Ghana is among seven countries in sub-Saharan African and 29 countries in the developing world to achieve the MDG 1 hunger target and the world food security goal of having the number of hungry people by 2015. The proportion of the population suffering from chronic hunger has declined from 47.3% in 1990–92 to less than 5% in 2012–14. The Ghana 2012 *Comprehensive Food Security Vulnerability Analysis (CFSVA)* however identifies northern Ghana (Northern, Upper East, and Upper West Regions) as the most vulnerable and food insecure region of the country (Hjelm & Dasori, 2012).

According to the Ghana Statistical Service (GSS, 2014a) report on the sixth Ghana Living Standards Survey (GLSS 6) 2012-13, the rural population comprised 50% of the national population and accounted for 78% of people living in poverty. Poverty is also higher in the rural Savannah which accounting for 40% of the overall national poverty. GLSS 6 defines extreme poverty as when an individual's "… the standard of living is insufficient to meet their basic nutritional requirements (2,900 calories per adult equivalent of food per day) even if they devoted their entire consumption budget to food". An estimated 8.4% (more than 2.2 million people) of the population is extremely poor, given the extreme poverty line of GH¢792.05 per adult per equivalent year. Extreme poverty is a rural phenomenon and more pronounced in the rural savannah which accounts for 27.3%, nearly three-fifths of the living in extreme poverty. The Northern Region alone accounts for almost a quarter of the extreme poor in Ghana.

Food insecurity and malnutrition are widespread features in conflict regions with and particularly severe, persistent and extensive in areas with protracted crisis (FAO *et al.*, 2015).

Though Ghana has experienced relative peace over the past decades, there have been situations of internal ethnic conflict which has marred the development of some parts of the country.

The Konkomba-Nanumba ethnic conflict which first occurred in April 1981 is one of such conflicts. Awedoba (2010) analyse that access to land was an influential factor in the outbreak of conflict though it was not cited as the direct cause. The Konkomba, one of the ethnic factions involved in the conflict are farmers who practice a form of shifting cultivation. The Konkomba, have numerical strength whiles the Nanumba are the ruling class. Inability to resolve the conflict fully resulted in another escalation of the conflict in 1994 which was popularly called "The Guinea Fowl War". During the conflict, economic activities, especially farming comes to a standstill. The conflict has retarded the social and economic development in this area with poverty becoming more entrenched.

The lack of opportunities, poverty and sporadic conflict in the area has resulted in massive out-migration from the area and a disincentive for engaging in vibrant economic activities. As such, the major livelihood opportunity for the people is farming and a few formal sector employment opportunities. Agriculture employs more than three quarters (79.4%) of the working population in the Nanumba North district (GSS, 2014b) and as such remains a determining factor in ensuring household food security.

Households in the Nanumba North district face many challenges (poverty, conflicts, limited economic opportunities). Coupled with this is the fact that small agriculture, especially small-scale farming is dominant in this region. The combination of these factors is likely to have serious implications on the food security of households in this area. This study, therefore, seeks to analyse the food security status of small-scale farm households and assess household socioeconomic characteristics that influence the food security status of households. The principal research question for the study is: *What is the effect of household socio-economic characteristics on the food security status of small-scale farming households in the Nanumba North District of Ghana?* The related research questions for the study are:

1. What is the food security status of small-scale farming households?
2. What is the relevance of socio-economic characteristics on the food security status of small-scale farming households?
3. What are the constraints to household food security and what are the coping strategies adopted by small-scale farming households?

**1.3 Objectives of the Study**

The main aim of this research is to examine the household socio-economic characteristics and food security of small-scale farmers in the Nanumba North District of Ghana.

The specific objectives of the study are:

1. To determine the food security status of small-scale farming households.
2. To determine the relevance of socio-economic characteristics on the food security status of small-scale farming households.
3. To rank the constraints to household food security and the coping strategies adopted by small-scale farming households.

**1.4 Relevance of the Study**

Ensuring that households in vulnerable communities are food secure is imperative to addressing food security challenges in Ghana. Despite the country's success in reducing the number of people suffering from chronic poverty, the widening inequalities in the country presents new challenges in sustaining this record. Ability to address challenges that vulnerable and poorer communities face in achieving household food security remain paramount to ensuring food security in the entire country.

According to FAO (2012), 65% of Ghana's land area in is suitable for agricultural production but only 28% percent was cultivated in 2007. Smallholder farms account for 80% of the total agricultural production though the average farm size is about 1.2 hectares. Smallholder farms are mainly owned by rural dwellers that often live in poverty. Though they are crop producers, they sometimes are unable to secure sufficient food for their household consumption. The level of deprivation of rural farm households is worse in the northern part of the country.

Northern Ghana is relatively poorer in natural resources and lacks behind other parts of the country in development. The north is characterised by widespread poverty and limited opportunities. The vulnerability of some communities in this region further is worsened by conflicts. The main livelihood activity for rural households in this region is crop farming. Produce from the farm provides food for household consumption.

However, there remain many socio-economic factors that influence the ability of households to provide sufficient food for household consumption. Recognizing the constraints of

household food security as identified by households also provides information for target support for households. Often, households are pushed to adapt eating habits and livelihood behaviours when their food security is threatened. Such coping strategies could further increase the vulnerability of households. This study is, therefore, focused on addressing these issues within the Nanumba North District of the Northern region of Ghana.

The study will provide information on the food security status of small-scale farm households and identify the social and economic factors that are likely to influence the food security status of these households. This information will support the programmes of Civil Society Organisations (CSOs), Non-governmental Organisations (NGOs) as well as government agencies that are working to improve the food security among households in vulnerable communities in the northern Ghana.

## 1.5 Organisation of the Study

The study consists of five chapters with each chapter having sub-sections which expatiate on the main topic of the chapter. Chapter one is the introduction to the study. It provides a background to the study; identifies the problem at stake and outlines the objectives of the study. It also discusses the significance and organisation of the study. Chapter Two provides a literature review of the study. It delves into the definitions and dimensions of food security and reviews literature on the study objectives. Chapter three comprises of the methodology for the study. It discusses the conceptual and theoretical frameworks as well as the study area and the method used for data collection. Chapter four discusses the results of the data analysis while chapter five concludes the study and makes policy recommendations for addressing household food security challenges of rural small-scale farming households.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Introduction

This chapter reviews related literature for the study. The literature review covers relevant aspects of the concept of food security: definitions of food security and related terminologies, dimensions of food security, rural small-scale farming with a focus on Ghana, food security of small-scale farm households, constraints to household food security and food security coping strategies.

## 2.2 Defining Food Security

The development of the concept of food security is grounded in the 1948 UN Universal Declaration of Human Rights. Article 25 identifies the right to food as one of the core components in achieving the right to a standard of living adequate for health and well-being (OHCHR, 2016). Food security is a multi-faceted concept covering a wide scope of issues and variables that have been developed over the years. This shows various attempts to capture the concept in its totality (FAO, 2003).

FAO (2003), (2006) and Pinstrup-Andersen (2009) identify that food security can be studied at the individual, household, national or global level. It often seeks to address imbalances between demand and supply forces of the food chain. Food security studies at the individual or household level are concerned with demand variables; addressing issues of physical and economic access by all people including the vulnerable, and addressing issues of adequate nutrition and well-being. At the national or global level, studies focus on supply issues; issues of adequate global supplies and food sovereignty.

Pinstrup-Andersen (2009) further discusses that food security initially described a country's access to enough food and was synonymous to self-sufficiency, which explains a country ability to produce the food demanded by its population. National food sovereignty describes the ability of a country provide the food needed by its population regardless of whether it is produced locally or imported. Currently, there is an increasing shift in focus to addressing food security at the household and individual levels, especially among vulnerable populations. The shift in focus from global to household food security can be seen in the development of the food security definition.

Initial definitions of food security focused on availability and accessibility of food. The World Food Conference of 1974 focused on volume and stability of food supplies globally, defining food security as having available, adequate world food supplies of basic foodstuffs to support a steady increase in food consumption and balance variabilities in food production and price (FAO, 2003 & 2006). This definition was expanded by the Food and Agricultural Organisation (FAO) in 1983 to embrace securing physical and economic access by vulnerable people to available supplies (FAO, 2003). In 1986, the World Bank defined food security as "access by all people at all times to enough food for an active and healthy life" (Reutlinger, 1986). It identified availability and ability to acquire (access) as essential elements and introduces the concepts of chronic and transitory food security as the two types of food insecurity (Reutlinger, 1986).

The World Food Summit of 1996 definition of food security included the individual and household dimensions. Food security at the individual, household, and national level is realized "…when all people, at all times, have physical, and economic (and social) access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2003, p.6; FAO & WFP, 2010, p.8). These latter definitions reinforced the multidimensionality of food security by introducing issues of food safety, nutritional composition, food preferences and issues of physical and economic access by all people including the vulnerable (FAO, 2006). Food preference in this context refers to food that is socially and culturally acceptable and consistent with religious and ethical values, rather than a broader interpretation to mean a household or individual preference for a particular food (FAO, 2003; Pinstrup-Andersen, 2009).

Currently, the ethical and human rights dimension of food security has received increased attention. Human Right to food acknowledged by the 1948 UN Declaration of Human Rights has been given new impetus by providing a rights-based approach to addressing food security (FAO, 2006).

In Ghana, the Ministry of Food and Agriculture (MoFA) defines food security as "good quality nutritious food, hygienically packaged and attractively presented, available in sufficient quantities all year round and located at the appropriate places at affordable prices" (Ministry of Food and Agriculture [MoFA], 2007).

## 2.3 Dimensions of Food Security

Various academic discourses have argued out the relative importance of the supply side or demand side of the concept of food security. Amartya Sen's suggested that food insecurity is a demand concern, affecting the poor's access to food than a supply concern, affecting the availability of food at the national or global level (Feleke, Kilmer & Gladwin, 2005). In a study on food security among Southern Ethiopian households, Feleke *et al.* (2005) concluded that the supply-side variables were more powerful determinants of food security than demand-side variables. Matchaya and Chilonda (2012) in a study on food security in Malawi, however, opined that addressing challenges related to food security go beyond solving food supply concerns.

Ahmad and Farooq (2010) identify availability and access as two important dimensions of food security. Barrett (2010) also identifies availability, access, and utilization as inherently hierarchical pillars of food security. Availability is necessary but not enough to ensure access while access is also necessary but not enough to ensure utilisation. Jrad, Nahas and Baghasa (2010) also present five fundamental dimensions of food security as availability, access, the stability of supply and access, utilisation, and food and nutrition safety. This is presented in Figure 1 below.

**Food Availability:** It refers to having sufficient quantities of food of appropriate quality, supplied through domestic production, purchased from local market or imports as well as food aid (FAO, 2006). Food availability encompasses the quantity, quality, and diversity of food available to households FAO (2015).

**Food Access:** It refers to obtaining the adequate resources (entitlements) needed for acquiring appropriate foods for a nutritious diet (FAO 2006). Entitlement explains a household's ability to express effective demand for food. Effective demand is expressed through a household's own production of food or ability to purchase food with income from other activities or transfers (FAO 2003). Access is also determined by physical, financial, social and political factors (Kuwornu, Mensah-Bonsu, & Ibrahim, 2011).

**Stability of supply and access:** This means food must be available and accessible at all times to the household. The household must be insulated to overcome sudden shocks or cyclical events relating to seasonal food insecurity.

**Utilisation:** Antwi (2013) analysed that individual utilization will depend on a person's physiological needs, health status etc. Food utilisation and nutrition encompasses having an

adequate diet and non-food inputs such as clean water, sanitation, health care and to meet all individual physiological.

**Food and nutrition safety:** This includes ensuring that food is rid of food-borne biological pathogens, chemical toxicants, and other hazards. This is a great concern in developed economies where issues of environmental protection, animal health and welfare and in food production have become topical issues. This is not a priority in the developing world where accessibility and availability of food still remains a challenge (FAO, 2002).

Figure 2 1: Dimensions of Food Security
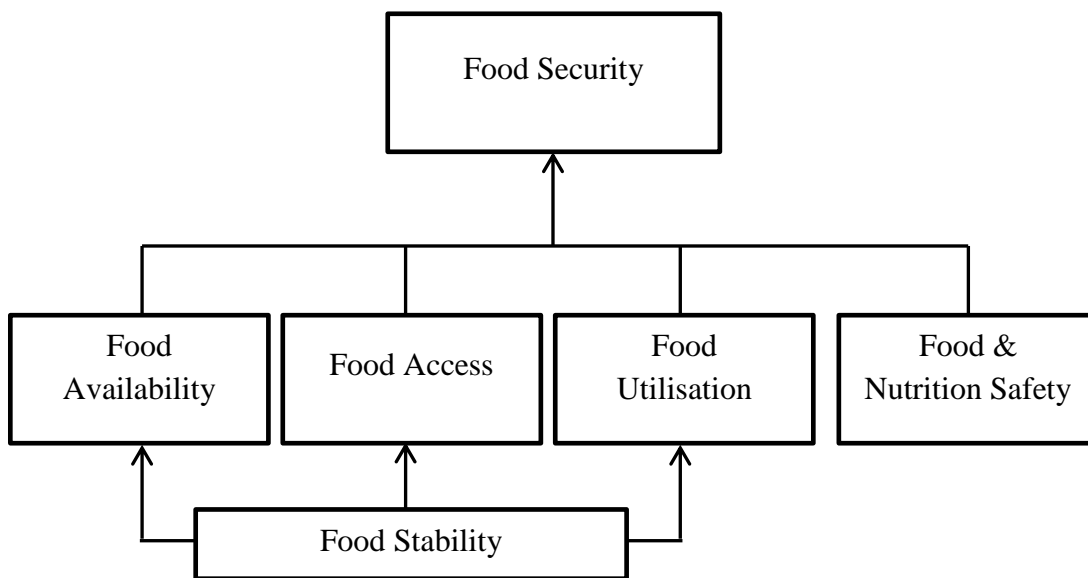


Source: Author

## 2.5 Definition of Relevant Terminologies

### 2.5.1 Household

A household refers to a person or a group of persons who live together in the same house or compound and share the same housekeeping, cooking arrangements or economy (GSS, 2013). The household remains the primary logical social unit for analysing access to food, consumption and food use in spite of intra-household inequities in the distribution of food (Bentley & Pelto, 1991). The household provides a meaningful unit for analysis because within the household resources are pooled, income is shared and decisions are made by adult members (Ellis, 1993).

### 2.5.2 Household Food Security

A household food security is realized when members of the household always have access to adequate and healthy food that meets their dietary needs without having to fall back on food aid, scavenging, stealing, and other coping strategies to meet their food needs (Andersen, 1990).

According to Pinstrup-Andersen, (2009), household food security is achieved when a household is able to acquire the food needed by its members to be food secure. However, household food security does not necessarily translate to food security for all household members. Similarly, the ability to acquire does not always result in the actual acquisition of food. Other household needs such as providing shelter or health care may be prioritised over food. Also, the intra-household distribution of food may not meet the individual needs of each member.

FAO (2003) maintains that to ensure food security at the household level, it is important to identify vulnerable households and household characteristics such as location: (rural/urban; small village/large village; remote province/near to capital city etc.), composition: (male/female head, size, dependency ratios and age) and sources of income: (production, employment, trade, remittances and other transfers). Furthermore, the concept of household entitlement to food, as postulated by Amartya Sen also highlights the importance of understanding the means by which households acquire their food: household production, other income-generating activities (the sale of labour or trading), and transfers from external sources (the state, friends or relatives).

### 2.5.3 Household Food Insecurity

Food insecurity occurs when households experience limited or uncertain physical, social or economic access to food and sometimes resort to socially acceptable ways to acquire food (Andersen, 1990; FAO, 2003).

The World Bank report on *Poverty and Hunger* also defines food insecurity as the lack of access to enough food. It differentiates between chronic and transitory food insecurity. Chronic food insecurity is structural in character. It results from the persistent inability of households to obtain adequate food due to inadequate access to resources. It is characteristic of households persistently lacking the means to either produce their food or purchase enough food. Transitory food insecurity however describes a temporal reduction in a household's

access to enough food as a result of human-induced causes such as conflicts, economic failures, fluctuations in the price of food, food production or household incomes as well as shocks due to natural disasters (famine, flooding and earthquake) which create temporal food shortages. Even in the absence of chronic and transitory food insecurity, people may suffer from the lack of essential micronutrients referred to as "hidden hunger" (Quaye, 2008; Reutlinger, 1986).

Though situations of extreme food insecurity can culminate in malnutrition and hunger, malnutrition and hunger are not necessary components of food insecurity (Blumberg, Bialostosky, Hamilton & Briefel, 1999).

## 2.6 Rural Small-Scale Farming

The term small-scale farming is often used interchangeably with terms such as traditional, subsistence or peasant farming. Asogwa and Umeh (2012) reiterate that agriculture is the main source of livelihood for many poor rural people in developing countries, providing them with both income and food entitlements. Agriculture is, therefore, an important determinant of household food security and crucial for the eradication of poverty and food insecurity. A small scale farming household is "a farm household that has access to their means of livelihood from the land, utilising mainly family labour in farm production, always located in a larger economic system, but fundamentally characterised by partial engagement in markets which tends to function with a degree of imperfection" (Ellis, 1993).

The Ghana Food and Agriculture Sector Development Policy (FASDEP II) acknowledges that agriculture in Ghana is predominantly practised on small-scale, family-operated farms which use rudimentary technology to produce about 80% of Ghana's total agricultural output (MoFA, 2007).

In the book *Peasant Economic*s, addressing farm household and agrarian economics, Ellis (1993) identifies farming as a livelihood activity, rights to access to land, predominance of family labour and subsistence production as characteristics of the small scale farming household. Such farming households are typical in rural areas, where they gain their livelihood from the land mainly through crop farming, although they may have some form of livestock.

Access to land for farming for most small-scale farmers is through complex traditional rights which in some cases are inalienable. Land among rural small-scale farming communities is

more than a factor of production with a price. Land secures the long-term food security of the household and forms as intrinsic part of the social status of the household.

Another important character of small-scale farming households is the reliance on family labour for production, although hired labour may be used during peak periods (clearing of land or harvesting). Members of the household also sometimes sell their labour outside the farm on *ad hoc* basis. This often provides additional income for the household, especially during seasonal troughs. Lastly, the subsistence livelihood basis is typical of small-scale farming households. Subsistence describes the proportion of farm output directly consumed by the household instead of being sold on the market.

## 2.7 Food Security of Small Scale Farming Households

In analysing food security among farming households, various studies conclude that the socio-economic characteristics of the household have a significant influence on the household food security status (Asogwa & Umeh, 2012; Kuwornu *et al.*, 2011; Ojeleye, Saleh & Oyewole, 2014). The subsequent paragraphs will discuss some of the social and economic characteristics that influence household food secure.

Many small-scale farmers are subsistence producers; they primarily produce to provide household food needs and then sell excess produce on the market. Income generated through such purchases is used to purchase food items that are not produced as well provide other household needs. Income from the farming activity is, therefore, important to ensure the effect demand of the household and likely to ensure household food security. Agriculture, especially crop farming in Ghana is dependent on rainfall and therefore highly seasonal in character. This leads to the seasonality of household food and income supply which can negatively affect food security.

Farm households like all other households have an individual who is considered the leader or head of the household unit. The household head refers to the individual recognised as such by the other household members or the person most responsible for the upkeep of the household (GSS, 2013). Gender of household head is critical for achieving household food security in rural areas. The gender of the head often impacts on the household revenue.

According to MoFA (2007), 48.7% of the total female population in Ghana is self-employed in the agricultural sector, mainly in food production. This notwithstanding, gender inequality and discrimination against women are prevalent in the agricultural sector. In northern Ghana,

females do not have the same opportunity to earn income as their male counterparts. This greatly limits the ability of female-headed households to secure sufficient food for household consumption. Similarly, Hjelm and Dasori (2012) identify that female-headed households account for nearly 8% of households in northern Ghana. However, 30% of female-headed households are food insecure compared with 15% of male-headed households. FAO (2012) also identifies that in Ghana, female owned subsistence farms also grow a lower diversity of crops than their male counterparts. Women also hold fewer and smaller farms than men. This trend has serious implication for the food security of households headed by females.

The age of household head is expected to impact on his or her labour supply for food production. Babatunde, Omotesho & Sholotan (2007) identify that the age of the household head will determine the extent of participation in off-farm employment to provide additional income for household use. To this end, a younger household head shows more potential to raise additional income. Similarly, younger people have more strength and are more likely to have a higher production output than older household heads. The situation is, however, different for urban households as Arene and Anyaeji (2010) conclude that older household heads were food secure than younger household heads.

FAO (2012) cites education as an important constituent of human capital which plays a fundamental role in determining household access to better employment opportunities and escape from poverty. However, in Ghana, literacy level is low and even much lower in rural areas and the northern regions of the country. These areas also show the greatest disparity in the gender differences in literacy. High illiteracy levels among farmers in Ghana limits their ability to respond to opportunities because of inadequate knowledge of skills and their risk aversion strategies (MoFA, 2007). An educated household is more likely to derive the maximum output from agricultural activity and thus increase the food security potential of the household.

Asogwa and Umeh (2012) in their work on food insecurity among rural farm households in Nigeria acknowledge that households with a larger family size have a higher probability to be food insecure. Such households will have to produce more to feed itself while a limited quantity of its produce will be sold in the market for income. Oluyole *et al.* (2009) however identify that an increase in household size decreases the probability of the household to be food secure.as there will be more mouths to feed with the same resources if the household size should increase.

The number of years the household head has been practicing farming is known as the farming experience (Kuwornu *et al.*, 2011). Traditionally knowledge and skill about the farming (the seasons, soil, crop yield, pest and disease control) are gained through years of experience. The years of practicing farming, therefore, impact greatly on farm productivity holding all other things constant. Studies by Feleke *et al.* (2005) and Oluyole *et al.* (2009) in Ethiopia and Nigeria respectively, identified that household heads with more years of farming experience were food secure.

In rural communities, land for farming is accessed mainly through inheritance and to a lesser extent through outright purchase. In Ghana, most of the land used by farming households is distributed free of charge by the village or family and only a small percentage of farm lands are bought or rented lands (FAO, 2012). However, Jayne, Mather, and Mghenyi, (2005) identify that an increasing trend in African agriculture is a steady decline in the land-to-person ratio and the ratio of arable land to the agricultural population. Inequality in land access continues to be a challenge for poverty reduction and achieving food security among the vulnerable population. In Ghana, rural women become landowners at an older age (mostly when they are widows) due to inheritance practices (FAO, 2012).

Heemskerk and Wennink (2004) identify Farmer Based Organisations (FBO) as a rich social capital in rural communities. FBO provide an essential component for achieving agricultural development through local innovation and provide many support services to rural small-scale farmers. Furthermore, they support the formation of Agricultural Development Plans at the district level and help direct research and extension programmes to address the needs of farmers. Heemskerk and Wennink argue for the empowerment of FBO into strong networks of multi-tiered groups in order to provide a greater bargaining chip for farmers over the agenda of agricultural service providers (Heemskerk & Wennink, 2004).

Often, farmers who belong to FBO receive various supports including extension service which help boost productivity as well as improve the market opportunities for the farmer. This is likely to have a positive impact on the food security status of the farming household (Heemskerk & Wennink, 2004). Access to extension services provides farmers an opportunity to get useful information on input and output prices, farming techniques, health consumption and other forms of farm and nutritional advice. It is expected that extension services would be positively related to food security.

Development practitioners increasingly realise the capacity of poor households to make effective use of credit to raise their incomes and access to food and other necessities (Diagne & Zeller, 2001). Access to credit (either in cash or kind) for direct consumption or to support production also influences a household's food security status. Babatunde *et al., (*2007) suggest that consumption credit increases the short-term household income and food access while production credit increases household access to productive resources (seeds, fertilizers, pesticides and other inputs) to improve crop production and household food security.

Diagne and Zeller (2001) in their study on rural financial markets and household food security in Malawi, however, realise that the provision of credit to poor smallholder farmers by formal credit institutions has no significant impact on crop income, food security and the nutritional status of the debtors. Such credit schemes focus on the production of fertilised hybrid maize and tobacco which at best have an indirect impact on household food consumption through the potential effect of income. They, however, do not offer financial products such as consumption credit and precautionary savings which directly impact household food security.

Adams (1978) recognizes that contrary to the assumption that rural households are too poor to save, substantial household savings capacities exist, and rural household savings are strongly influenced by rural financial markets. In Africa, many farmer-based cooperatives mobilise savings through postal savings, savings banks, and credit-savings unions. Financial savings also has a favourable impact on discouraging household consumption. Positive real rates of interest on savings provide an incentive for households to defer consumption. This could have an indirect impact on household food security.

Farm size is the total area of land cultivated by the households. Agriculture in Ghana is characterised by small farms (FAO, 2012) with 90% of farms being less than 2 hectares in size (MoFA, 2007). Jayne et al. (2005) identify a positive relationship between farm size, household income, and household food security. It is estimated that *ceteris paribus*, households with a larger farm size will have a higher crop yield and food for household consumption than households with smaller farms.

Ojeleye, Saleh & Oyewole (2014) identify that access to non-farm income has significant influence farming household's food security status. Average non-farm income share in West Africa is 36% (Reardon *et al.*, 1998). Rural small scale farmers in Africa engage in other income generating activities to augment their main source of income from direct farming.

Ojeleye *et al.*, (2014) defines non-farm income is any source of income not generated through agricultural activities. It includes profits earned from non-farm enterprises owned by households or household members or individually operated cottage industries such as handicrafts, petty trade, transport, small industry, services and diverse non-farm activities. According to Reardon *et al.*, (1998) non-farm income increases the household's access to food, provides cash for re-investment in productivity-enhancing inputs and supports the growth of rural non-farm enterprises such as agro-processing and distribution in the food system. Agricultural policies inform the nature and performance of the agricultural sector which determines the dynamism of rural non-farm activities. The development of the rural non-farm sector is determined by the opportunities for processing and distributing farm produce, providing services such as repair of farm equipment, selling farm inputs and supporting the local economy through the purchase of local good and services with income from the farm.

Income diversification is common among rural farming households. Reardon (1997) identifies the dominant importance of non-farm wage labour compared to self-employment, off-farm earnings compared to wage earnings from the farm sector and local non-farm earnings compared to migration earnings in rural Africa. He identifies that diversification of income sources in rural areas contribute to household food security and boost farm investments.

Decisions on resource use at the household level can influence the household food security status especially when resources are limited. Thomas (1990) in a study on the intra-household resource allocation in Brazil conclude that unearned income in the hands of a mother has a greater effect on the household's health and nutritional status than when under the control of a father. As such, it is essential to consider gender relations in intra-household decision-making and resource management in designing development policies and programmes (Young, 1992).

Babatunde *et al.,* 2007 identify household income as one of the important determinants of household food security. Household income denotes the sum of earnings of the household from both off-farm and on-farm sources. According to Arene and Anyaeji (2010), the more household head engage in gainful employment, the higher he/she earns income and the greater the chances of being food secure. The income is expected to increase household's food production and access to more quantity and quality food.

**2.8 Constraints to Household Food Security**

Rosegrant and Cline (2013) opine that crop yield has reduced in many parts of the world has reduced due to declining investments into agricultural research, irrigation, rural infrastructure and growing water scarcity. Climate change and the HIV/AIDS pandemic also present new challenges to food security. Climate change connotes the modification of global climates, persisting for decades or longer, as a result of human activity that alters the composition of the atmosphere (Devereux et al., 2013). Rosegrant and Cline further assess that in tropical climates, climate alteration is likely to cause more intense rainfall and prolonged dry seasons which will reduce or considerably vary the water available for irrigation. These conditions are likely to stimulate the growth of pests and diseases and will negatively affect the crops and livestock production. Climatic extremes can cause erosion and desertification. Unlike the developed world with the capacity to adapt at forestall negative effects of climate change, many developing countries will be adversely affected (Rosegrant and Cline, 2013).

In many parts of Africa, extreme climatic conditions (droughts, flooding, etc.) have untoward repercussions on household food security. The unfavourable climatic condition can be a chronic driver of food insecurity and can also be experienced as a shock (Gregory, Ingram & Brklacich, 2005). In Africa, agriculture is mostly rain-fed with irrigation being marginally practiced. In a study in Niger on the factors influencing household food security Zakari, Ying and Song (2014) note drought as the major factor identified by respondents to be the main cause of food insecurity.

Other important climatic factors identified include flooding, irregularity of rainfall; low rainfall and erratic rainfall. On one hand, for many rural communities, droughts mean a limited access to food as the reduced farm produce is insufficient to support households demand for food. The low supply of food further increases the prices of the available food on the market. Households depending on their own production of food often lack the purchasing power to buy food at high prices. On the other hand, periods of prolonged droughts are succeeded by heavy and destructive floods which destroy surviving crops.

Similarly, the destruction of farm produce has a direct impact on the ability of households to secure their food needs. This can result from extreme climatic conditions as well as disease and pest infestation. Symmons and Cressman (2001) and Streedman (1990) note that the Desert Locust plague of 1986-89 and the subsequent upsurges in the 1990s demonstrate the continuing capacity of the pest to threaten agriculture and food security over large parts of

Africa, the Near East and southwest Asia. It is known to have a devastating effect on plants with total crop losses being experienced in just a few hours. This locust was responsible for many famines in the past in countries where invasions took examples being Ethiopia and in Sudan in the 1950's (Lecoq, 2003).

The increase in the cost of fuel also presents challenges to household food security. Higher fuel prices affect poverty levels due to fuel's wide economic linkages, with the effect being pronounced in countries that are net importers of fuel (Arndt, Benfica, Maximiano, Nucifora, & Thurlow, 2008). Ruel, Garrett, Hawkes, & Cohen (2010) also identify that high fuel prices are likely to have a greater impact on poverty than food price increases in Mozambique.

The impact of fuel on household food security is greatest among poor urban households since they are often net consumers of food. As a result, most urban dwellers switch to consuming street foods because the price usually increases at a slower pace due to the economies of scale of production and also because they can be purchased in small amounts. However, street foods are often prepared in precarious sanitary conditions and can result in food-borne diseases. They also present new challenges to urban health as they are usually unhealthy and increase the risk of obesity and chronic diseases (Ruel *et al.*, 2010).

In many rural areas, food markets exist, where rural farmers trade their farm produce with neighbouring communities. However, such markets are often thin and isolated as a result of high transport costs and limited agricultural productivity. Consequently, rural farmers are challenged with food prices that are unstable and highly correlated with their own agricultural output (Fafchamps, 1992). The impact of price volatility of food price on the food security status of households depends on whether the household is a net consumer (buyer) or net producer (seller) of food items. As earlier noted, urban dwellers are often net consumers are more likely to suffer from food price hikes. This notwithstanding, the rural poor also suffer effects of food price increases. The effect on rural households is varied and will depend on the structure of consumption and household crop production and marketing opportunities (Arndt et al, 2008).

Hjelm, and Dasori, (2012) cite high food prices in Ghana as a major constraint to household food access. Poor market infrastructure such as roads and storage centres limits farmer's ability to produce, sell and store production surpluses. Seasonal fluctuations in prices generally affect poor households who often buy their main staples when prices are highest because they lack money to purchase bulk quantities when prices are lower and storage

facilities to store bulk produce from their harvest. Gregory, Ingram & Brklacich (2005), note that food price increase as a constraint to food security is mainly experienced as a shock.

FAO (2012) recount that in rural Ghanaian communities, relatives or friends are the main sources of household credit. Female farmers are heavily reliant on informal networks (family, friends, other farmers, moneylenders) for credit while male farmers have better access to credit from formal institutions. Hjelm and Dasori (2012) further mention that wealthier households are more likely to have a loan or be in debt than poorer households. The need to reimburse debts is likely to limit a household's ability to purchase food with the limited income available.

The health status of households also influences the household's capacity to provide for its food needs. When the health status of the adult labour in the household is compromised, the household often faces a lower capacity to produce or buy food. For example, the HIV/AIDS pandemic aside its direct health, economic and social impacts also affects food security. Aside reducing farm labour, sickness and death often deplete household's asset for medical or funeral costs (Rosegrant & Cline, 2003).

Credit facilities offered to farmers despite their numerous benefits for the household can threaten the households' ability to provide its food needs. Households that borrow realises lower net crop incomes than non-borrowers which highlight the risk associated with borrowing; borrowers can become worse off after repaying the principal and the interest Diagne and Zeller (2001).

## 2.9 Coping Strategies to Food Security

The ability of households to circumvent periods of food insecurity depends not only on the household asset base but also, the household's capacity to manage such assets to provide income, food or basic necessities (Moser, 1998). Households often adopt strategies to forestall threats of food insecurity. Such strategies can have both a short-term impact on household food security as well as a long-term impact which can, in turn, threaten the households' future access to food. The strategies may be focused on raising more income; for example, sending children to work for money, scavenging, selling assets, borrowing money or food, exchanging food items and purchasing on credit. However, a more likely method in the short term is to adjust household consumption by reducing the quality, quantity meals for household members (Kuwornu *et al.*, 2011; Moser, 1998; Ojeleye *et al.*, 2014).

Hjelm & Dasori (2012) study on food insecure households in northern Ghana identify the following as strategies used by households to preserve their food security status: reducing the number of meals, borrowing food, consuming less preferred food, buying food on credit, gathering unusual food, having household members eat at relatives, reducing adult consumption so that children can eat, relying on casual labour, feeding working members at the expense of non-working members, going entire day without eating and consuming seed stock. Households in the poorest wealth quintile resort to severe and harsh coping strategies than wealthier households- 13% of households in the poorest quintile had gone an entire day without eating on at least one day during the week preceding the survey compared with 3% in the wealthiest quintile. Among the various livelihood groups, reducing the number of meals, reducing adult consumption so that children can have sufficient food and consuming less preferred food are the three most used coping strategies in order of importance.

However in a study of the food security status of households in the Central region of Ghana, Kuwornu *et al.*, (2011), assess that eating less preferred food comes as the first option for households for mitigating food insecurity. Limiting the size of food consumed, skipping meal within a day and maternal buffering are also important coping strategies. In maternal buffering, parents, especially mothers forgo their food so that the children can have enough to eat.

Kinsey (1998) also note that coping strategies adopted by rural households include reducing the frequency of meals, reducing the quantity served at meals, consuming of wild foods, that is edible, naturally occurring plants, fruits, and seeds as well as animals and insects.

Among rural households in Bangladesh, Del Ninno (2003) identifies borrowing to purchase food as most important coping strategy used to overcome limited access to food resulting from the 1998 floods. Households borrowed mainly from non-institutional sources such as family, friends, and neighbours rather than from Non-Governmental Organizations (NGOs) and banks. Other strategies included reducing expenditures and selling assets.

Kinsey (1998) however evaluates that remittances (kind and cash) from urban-based relatives play a minor role for rural households in Zimbabwe as a coping strategy in the smoothing household food supply.

Maxwell (1996) concludes that in adopting a coping strategy individuals and households often avoid strategies that will involve selling their assets to have access to food. Situations

where households are resort to selling personal and household assets to secure food point to extreme situations of household food security.

# CHAPTER THREE: METHODOLOGY

## 3.1 Introduction

This chapter presents the theoretical and analytical framework for the study. It comprises of the conceptual framework, theoretical framework, the method of data collection and data analysis.

## 3.2 Conceptual Framework

The study conceives food security as a tri-dimensional concept with a focus on availability, access, and stability. It identifies availability, access, stability, socio-economic characteristics, coping strategies, constraints, child food security and adult food security as necessary building blocks for addressing challenges with household food security.

Availability and access are two significant dimensions in addressing household food security that occupied earlier definitions of the concept and continues to play an important role in current research on food security. Availability addresses the demand end while access addresses the supply end of food security.

Figure 3.1 Food Security Conceptual Frame work
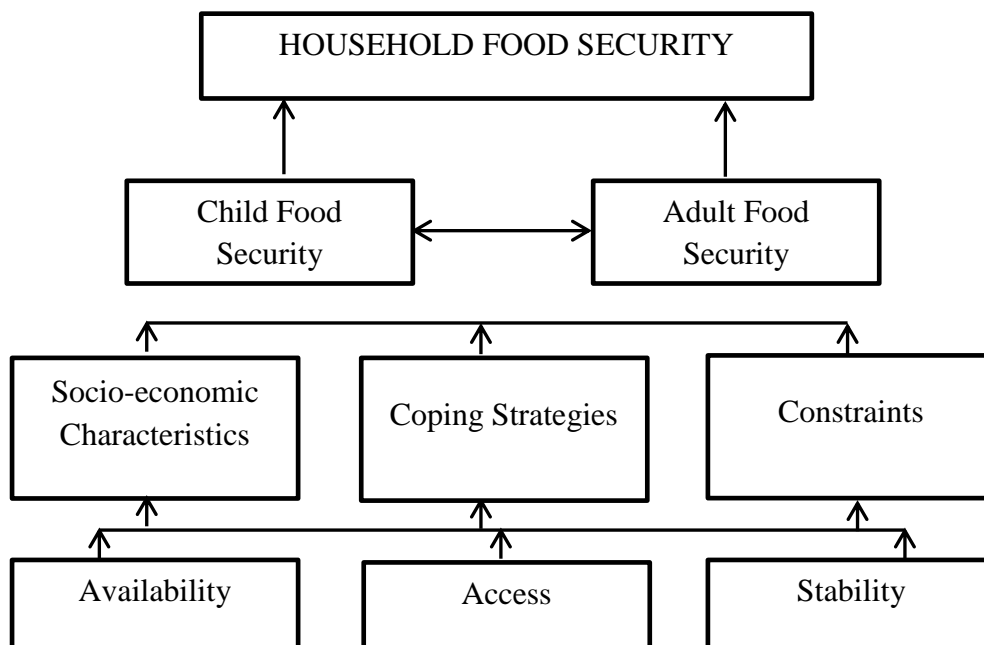


Source: Author

The study identifies building blocks for addressing household food security. They are availability, access, stability, socio-economic characteristics, coping strategies, constraints, child food security and adult food security.

Availability and access are two significant dimensions in addressing household food security that occupied earlier definitions of the concept and continues to play an important role in current research on food security. Availability addresses the demand end while access addresses the supply end of food security. Among small-scale farming households, stability as a dimension of food security is important because they often lack the capacity to ensure year-round production. Seasonality in agriculture in developing countries creates imbalances in food availability and food consumption resulting in seasonal food insecurity (Devereux, Sabates-Wheeler & Longhurst, 2013).

According to Babatunde *et al.* (2007) and Oluyole *et al.* (2009), the socio-economic characteristics of farming households are important determinants of their food security status. The total household income, educational status of the household head, the farming experience of household head and household size are important determinants of the food security status of rural households. Ojeleye *et al.* (2014) also identify that the gender of the household head often determines the farming activity practiced which also influences household food security. Male-headed households are more likely to be food secure than female-headed households (Zakari, Ying & Song, 2014).

Household often adopt new consumption patterns ranging from reducing quantities of food intake to going an entire day without eating as a strategy to weather periods of food insecurity. The coping strategies adopted by households include eating less preferred food, limiting the quantity of food consumed, skipping a meal within a day, maternal buffering (Kuwornu *et al.,* 2011), buying from market, borrowing money or food, rationing adult meals, sale of livestock, sending children to work for money and scavenging (Ojeleye *et al.,* 2014). Some studies have identified that coping strategies adopted by households often have a short-term effect (Kuwornu *et al.* 2011) and are reversible (Ojeleye *et al.,* 2014). Some coping strategies are however not reversible and as such detrimental to the livelihood and food security of households (Ojeleye *et al.,* 2014).

Identifying constraints small-scale farming households face in securing their food security is an important step in effectively addressing their food security concerns. In Ghana, small-scale agriculture is often rain-fed. In the savannah areas, the scarcity of rainfall and limited

irrigation often becomes a delimiting factor to agricultural productivity and consequently household food security for farming households.

Bickel, Nord, Price, Hamilton, and Cook (2000) propose a bi-dimensional household food security measure which probes household conditions, behaviours and subjective reactions of both adults and children (for households with children) to determine the food security status of households. Children show different trends in food security measurements. For households with children, a clear evidence of severe adult food insecurity in itself does not indicate food insecurity of, especially young children. As such, the only inferences about the food security status of children that can be made confidently from a unidimensional (adult) household-level food security measure is that children in food-insecure households face a higher risk of food insecurity than other children, with this risk of food insecurity rising sharply as the severity of household food insecurity rises.

## 3.3 Theoretical Framework

The theories used in the study are discussed in this section. They include the model for household food security measurement and categorization, the Binary Logit Regression model for determining socio-economic variables influencing household food security and the garret ranking method for ranking relevant constraints and coping strategies relating to the food security of small-scale farming households.

### 3.3.1 Model for Food Security Analysis

Bickel *et al.* (2000) acknowledge that food insecurity cannot be captured by a single indicator and suggests obtaining information relating to a variety of specific experiences, and behaviours that serve as indicators of the different degrees of severity of the condition. The HFSSM was adapted for this study to estimate the food security status of small-scale farming households. The HFSSM which was developed by the Canadians is an adaptation of the food security measurement developed in the United States and discussed in detail in the work: *Guide to measuring household food security* by Bickel *et al.* (2000). The HFSSM concentrates on self-reports of uncertain, insufficient or inadequate access to food, availability and utilization of food due to limited financial resources, and the resultant compromised eating patterns and household food consumption (Health Canada, 2007).

Household food security status over 12 months was classified using an adapted version of Health Canada's coding which derives a household variable based on responses to the

HFSSM adult- and child-referenced items (Table 3.1). Respondents were asked questions which probe situations of uncertain, insufficient or inadequate food access, availability, and utilization resulting from limited household financial resources and the compromised eating patterns and food consumption that may result. The questions capture four kinds of situations which show a household's food supply, as well as the psychological and behavioural responses of household members' (Bickel et al., 2000). The four types of situations captured are:

- Anxiety or perception that the household food budget or food supply was inadequate (F1);

- Perceptions that the food eaten by adults or children was inadequate in quality (F2, F3);

- Reported instances of reduced food intake, or consequences of reduced intake, for adults (F4, F5, F6, F7, F8, F9); and

- Reported instances of reduced food intake or its consequences for children (F10, F11, F12, F13, F14, F15).

Respondents were asked 15 questions that probe the food security situation in the household during the 12 months preceding the survey. 9 out of the 15 questions were targeted at the experiences of adults in the household and 6 were targeted at the children less than 18 years in the household. Questions relating to children were asked only if there were children in the household. Every question specifies either the lack of food or resources as a reason for the condition or behaviour being questioned.

The adult questions were of two types, the main question and a sub-question. For every main question, the respondent chooses between 0 being a No and 1 being a Yes. The sub-questions sought to provide the level of intensity of the main question and respondents chose between 0-rarely, 1-sometimes and 2-often. The 6 questions focused on the children also required a Yes or No answer. Subsequently, the responses were coded; an affirmative answer (Yes) was coded as 1 and a negative answer as 0. For the sub-questions, sometimes (1) and often (2) were taken as affirmative answers and thus coded as 1 while rarely (0) was taken as a negative answer and coded as 0. Per this coding, for the adult question, if the respondent provides a negative answer to the main question, the sub-question is recorded as a negative response (0) and not a missing variable.

The scores for the adult-referenced questions and the child-referenced questions are summed up separately to determine the food security status of the households using Table 3.1.

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Households that obtained a zero score for both adult and child-referenced items are categorized as food secure. Food secure households show no indication of difficulty with food access. Households that obtained a score of one for both adult and child-referenced items are defined as marginal food secure. Marginally food secure households demonstrate minimal difficulty with food access. Moderate food insecurity is indicative of compromised quality and/or quantity of food consumed by the household. It is indicated by 2 to 5 affirmative responses to the 9 adult-referenced items and 2 to 4 affirmative responses to the 7 child-referenced items. Severe food insecurity is indicative of reduced food intake and disrupted eating patterns. It is indicated by 6 or more affirmative responses to the adult-referenced items and five or more affirmative to the responses to the child-referenced items.

Table 3.1: Definition and Description of Groupings for Food Security Status

| Category | Scores | | Definition of Category | Description of Category |
|---|---|---|---|---|
| | 9-Adult Items | 6-Child Items | | |
| Food secure | 0 | 0 | No indication of difficulty with food access among either adults or children | No indication of difficulty with food access |
| Marginally food insecure | 1 | 1 | Either or both adults and/or children experienced marginal food security (and neither experienced moderate or severe food security) | Minimal indication of difficulty with food access |
| Moderately food insecure | 2-5 | 2-4 | Either or both adults and/or children experienced moderate food security (and neither experienced severe food security) | Indication of compromise in quality and/ quantity of food consumed |
| Severely food insecure | ≥6 | ≥5 | Either or both adults and/or children experienced severe food security | Indication of reduced food intake and disrupted eating patterns |

Source: Health Canada (2007)

A dichotomous variable differentiating households affected by food insecurity from those with higher levels of food security over the past 12 months was derived for use in further analysis because this is the dimension of food insecurity that is most in need of policy response and because predicting extreme events makes better use of the limited statistical power by providing more contrast between the food security groups within this vulnerable sample.

This approach has also been taken in a number of previous studies. By virtue of the thresholds used to demarcate food insecurity, households in this category provided indications of disrupted eating patterns and reduced food intake among either or both adults and/or children. For example, among adults, the threshold of 6 affirmatives captures items related to cutting or skipping meals or eating less than one thinks one should because of a lack of money or resources for food. Among children, the threshold of 5 affirmative items captures children not eating enough, cutting the size of children's meals, and children skipping meals. Households with full or marginal food security are classified as food secure while those with moderately or severe food security are classified as food insecure as shown in Table 3.2.

Table 3.2: Dichotomous Food Security Variable

| **Food Secure** | | **Food Insecure** | |
|---|---|---|---|
| Food Secure | Marginally Food Insecure | Moderately Food Insecure | Severely Food Secure |

Source: Health Canada (2007)

### 3.3.2 Limitations of the Model

Bickel *et al.* (2000) identify the following among the challenges to using this direct indicator method for assessing household food security. Firstly, the module does not capture all the dimensions of food security. It provides no indication of food safety, nutritional status, availability of food through "socially acceptable" channels, nor measures community-level factors such as the nature and sources of the available food supply. Similarly, it does not capture other possible reasons for compromised food consumption such as fasting or ill-health (Health Canada, 2007).

The module reflects a household's situation over the 12 months preceding the interview. Consequently, a household that experienced food insecurity at a particular period during the past year and thus classified as food insecure could be food secure at the time of the interview.

Additionally, the boundaries identified for addressing the household food security status are variable and could be debated to exaggerate or understate the number of households within the category. The categories, however, provide practical means for making comparisons and identifying relations with other factors. Once boundaries are clearly delimited measured consistently they provide an invaluable basis for comparisons and identifying changes in categories over time.

Furthermore, the measurement has not been proven to adequately assess the food security status of individual household members as it assesses the state food security of the entire household as a group. It can therefore not be concluded that all household member have the same food security status. The measurement is, however, reliable for describing the status of a population (Bickel et al., 2000 and Health Canada 2007).

### 3.3.2 Model Analysis of Factors Influencing Household Food Security

Different studies have employed various models to study factors influencing household food security. Among them are the Probit model (Oluyole et al. 2009), the Logistic regression model (Kuwornu *et al.*, 2011; Zakari *et al.*, 2014) and the Tobit Regression model (Etim *et al.*, 2010). The Logistic model was used for this study due to the simplicity of estimating its coefficients (Kuwornu et al. 2011).

Based on the dichotomous food security variable earlier identified (food secure and food insecure), the Binary Logistic model was employed to examine the factors influencing the odds ratio of the household food status. The odds ratio is the ratio of the probability that a household is food secure (Pi) to the probability that a household is food insecure (1 - Pi). The dichotomous food security variable was used as the dependent variable. This is a dummy variable that takes a value of 1 to describe a food secure household and a value of 0 for a food insecure household.

The relationship between the dependent variable (household food security status) and the 10 explanatory variables based on the logistic model is presented as:

$$FSS = log\left(\frac{Pi}{1-Pi}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \tag{1}$$

Where:

$FSS$ = Food security status

$P$ = The probability of the outcome (given the explanatory variables $X_1, X_2 \ldots X_k$)

$i$ = The i [th] observation in the sample

$\beta_o$ = The intercept or constant term

$\beta_1, \beta_2 \ldots \beta_k$ = Coefficients associated with each explanatory variable

$X_1, X_2 \ldots X_k$ = Explanatory variables

The coefficients ($\beta_1$, $\beta_2$ ... $\beta_k$) do not provide a direct explanation of the effect of change of the corresponding explanatory variables ($X_1$, $X_2 \ldots X_k$) on the probability (P) of an outcome. Instead, the coefficients show the effect the explanatory variable has on the odds ratio of the dependent variable (FSS) (Kuwornu et al. 2011, Zakari et al, 2014).

### 3.3.3 Model for Analysing Constraints and Coping Strategies

Ranking techniques help to create a set of variables which are ordinal in nature. This helps to compare the relative importance of the factors that are ranked. For this study, the Garret ranking technique was employed.

The Garret ranking technique (Sedaghat, 2011) is a fairly simple method for ranking the constraints to household food security and the food insecurity coping strategies adopted by households. Respondents are provided with a set of factors to rank and the total number of respondents' ranks for each factor is recorded in table (A). The ranks provided are converted into percentage positions and recorded in another table (B) using the following formula:

$$\frac{100(R_{ij} - 0.5)}{N_j} \tag{2}$$

Where:

$R_{ij}$ = Rank given for the i [th] factor by the j [th] respondent

$N_j$ = Number of factors ranked by the j [th] respondent

The Garret and Woodworth (1973) table is then used to convert the percentage positions of the ranks into the Garret values. The Garret value for each rank from the table (A) is subsequently multiplied by the total number of respondents' rank for each factor (table B) that received the corresponding rank. The product obtained is recorded in a new table (C).

The average score for each factor (product) is calculated and arranged in descending order (the highest value is ranked as 1).

## 3.4 Method for Data Analysis

Both descriptive and quantitative statistical techniques were employed in this study. The descriptive analysis made use of pie charts, frequencies and cross-tabulation tables. The quantitative techniques used were the HFSSM, the Binary Logit Regression Model and the Garret ranking technique.

### 3.4.1 Household Food Security Status

The HFSSM was used to address the first objective of identifying the food security status of households. Scores of respondents' answers to the 9adult-referenced and 6 child-referenced questions were used to categorize households as food secure, marginally food insecure, moderately food insecure and severely food insecure. A dichotomous variable of food secure and food insecure was then derived from the earlier categories. Food secure and marginally food secure households were categorised as food secure while moderately food insecure and severely food insecure households were categorised as food insecure households.

### 3.4.2 Factors Influencing Household Food Security Status

The binary logistic model was used to achieve the second objective. The food security status of households was determined as a function of 10 independent or explanatory variables. Table 3.3 presents the dependent variable and explanatory variables included in the model. The empirical description of the logit model is:

$$\Pr(Y=1) = \beta_0 + \beta_1 GENDER(HHH) + \beta_2 AGE(HHH) + \beta_3 EDUCATION(HHH) + \beta_4 HHSIZE + \beta_5 FBO + \beta_6 CREDIT + \beta_7 HH\ SAVINGS + \beta_8 FARM\ SIZE + \beta_9 HH\ NFE + \beta_{10} TR + U_i \qquad (3)$$

Where:

$\Pr(Y=1) = $ Probability that the household will be food secure

$\beta_1 to\ \beta_{10} = $ Coefficients associated with each explanatory variable

$\beta_0 = $ Intercept or constant term

$U_i = $ Error term

### 3.4.3 Description of Variables Used in the Binary Logit Regression

Ten variables have been hypothesised to affect the farm households' food security status. Per this hypothesis, the direction of the effect is positive, negative or not certain. Table X provides a description of these variables.

Table 3.3: Measurement and Expected signs for Logit Regression Variables

| Variables | Measurement | Expected sign |
|---|---|---|
| Dependent Variable | | |
| Food Security Status (Y) | 1=food secure, 0=otherwise | N/A |
| Independent Variables | | |
| Gender of HHH ($X_1$) | Dummy 1 = male, 0 = female | + |
| Age of HHH ($X_2$) | Years | +/- |
| Educational HHH ($X_3$) | Dummy 1= primary, 0 =otherwise | + |
| HH Size ($X_4$) | Number of persons | **+/-** |
| Membership with FBO ($X_5$) | Dummy 1 = yes, 0 = otherwise | + |
| Access to credit ($X_6$) | Dummy 1 = yes, 0 = otherwise | +/- |
| HH Savings ($X_7$) | Dummy 1 = yes, 0 = otherwise | +/- |
| Farm size ($X_8$) | Acres | + |
| Engagement in NFE ($X_9$) | Dummy 1 = yes, 0 = otherwise | +/- |
| Total Revenue ($X_{10}$) | Ghanaian Cedi | +/- |

Source: Kuwornu *et al.,* 2011; Ojeleye *et al.,* 2014; Oluyole *et al.,* 2009; Zakari *et al.*, 2014

### 3.4.4 Hypothesis Testing

This section provides the main hypothesis of the regression analysis and the decision rule of the hypothesis.

The main hypothesis for the Logistic regression analysis is given as:

$H_o : \beta_i = 0$

$H_A : \beta_i \neq 0$

The Null hypothesis ($H_O$) indicates that the explanatory variables (household socio-economic characteristics) have no significant influence in determining household food security status.

The Alternate hypothesis $(H_A)$ however indicates that the individual explanatory variables (household socioeconomic characteristics) have significant influence in determining household food security status.

### 3.4.5 Validation of Analysis

Model validation is important in model building. The validity of the logistic model demonstrates the stability and reasonability of the logistic regression coefficients, and the credibility and usability of the fitted logistic regression function and the ability to generalize inferences from the analysis. When the model is validated, it has a good fit and the results of the analysis can be extended to the corresponding population (Rana et al., 2010). The main hypothesis of the study is validated using the z-test. The z-statistic is given as:

$$Z_{stat} = \frac{\beta_i}{SE(\beta_i)} \qquad (4)$$

Where:

$\beta_i = $ Coefficients of the independent variables

$SE = $ Standard error of the respective coefficients

If the z-statistic is less than the critical value or significant at more than 10%, the null hypothesis (that the explanatory variables, that is, household socio-economic characteristics, have no significant influence in determining household food security status) will be rejected. However, if the null hypothesis will be rejected if the z-statistic is significant at 1%, 5% or 10% up to a 10%.

### 3.4.6 Model for Analysis of Constraints and Coping Strategies

The Garret ranking technique was used to achieve the third objective: to determine the most important constraints to household food security and food insecurity coping strategies adopted by households. Respondents (households) were provided a list (of 6 constraints and 10 coping strategies) to rank in order of merit. A rank of 1 is given to the most important item (constraint and coping strategy). The ranks provided by the respondents are subsequently converted into percentage positions using the formula:

$$\frac{100(R_{ij} - 0.5)}{N_j} \qquad (5)$$

Where:

$R_{ij} = $ Rank given for the ith factor (constraint/coping strategy) by the jth respondent

$N_j = $ Number of factors ranked by the jth respondent

Note: The number of factors $(N_j) =$ for the constraint analysis is 6 and for the coping strategy analysis is 10.

Once the percentage positions are calculated, the Garret and Woodworth (1973) conversion table is used for converting the percentage position of each rank into scores. For each item of both the constraint and coping strategy, the scores of the individual respondents are summed up and then divided by the total number of respondents (150 for both analyses). The average scores obtained for each constraint and coping strategy is arranged in descending order. Ranks are given to determine the most important constraints and the widely used coping strategies, with the highest average score ranked as 1$^{st}$ (Sedaghat, 2011).

## 3.5 Study Area

The study was conducted in the 6 communities (Kpambi, Ganguyili, Demanayili, Makayili and Lanja) of the Nanumba-North District of the Northern Region of Ghana. GSS (2014b) states that the Nanumba-North district is located in the eastern corridor of the Northern Region between latitudes 8.5°N and 9.25°N and longitudes 0.57°E and 0.5°W. The district is bounded by the Yendi Municipality to the north, Zabzugu-Tatale District to the east, East-Gonja District to the west and Nanumba South District to the South. The district is generally a flat land drained by many streams including the rivers Dakar and Oti. It lies within the savannah zone marked by high temperatures (29°C to 41°C) and relatively low rainfall records (1,268mm). GSS (2014b) further identifies that, unlike southern Ghana which experiences two peak rainfall seasons annually, the district like other areas of northern Ghana experiences a single peak rainfall season in September and an intense dry season (harmattan). During the rainy season, the district is saddled with flooding as rivers overflow their banks, submerging farmlands and settlements.

According to the population and housing census data (GSS, 2014b), the District has a total population of 141,581 people, accounting for 5.7% of the total population of the Northern region. 71.7% of the population of the district is rural. It has a youthful population with almost half of the population (47.6%) below age 15 years. The average household size is 8.2 persons per household with children forming the largest portion of household members at an average of 54%. The extended household is typical of the district making up 58.5% of households. It consists of the household head, spouse, children and relatives of the head of household.

Figure 2.1 Map of Nanumba North District
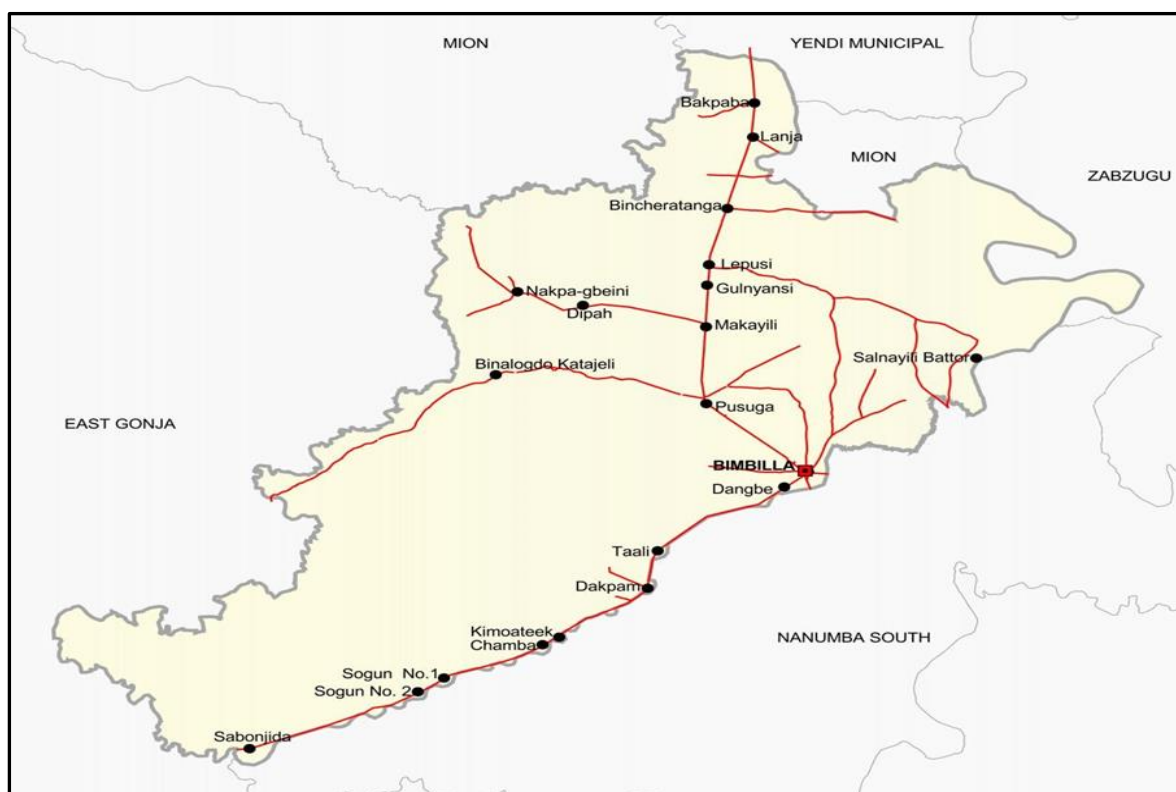
Agriculture is the main livelihood for people in the Nanumba North district employing more than three quarters (79.4%) of the working population. Wholesale and retail trade is the second highest employing 7.5%, followed by manufacturing (5.0%). Nine out of 10 households (96%) in the rural areas is engaged in agriculture while 69.8% of urban households are engaged in agriculture. 97.7% of households are engaged in crop farming. The main crops cultivated in the district are Maize, rice, millet, sorghum, yam, cassava, groundnuts, soybeans, and cowpeas (MoFA, 2015). Among livestock farming activities, poultry keeping (chicken) is most dominant in the district. Males dominate the agricultural sector while females play leading role in the wholesale, retail and manufacturing sector.

## 3.5 Method of Data Collection

Data for the study was collected in December 2015. The process of data collection was in two stages; the first stage involved four days of a preliminary survey of the local communities during which 5 of the proposed questionnaires were administered. The second stage involved the actual administration of the questionnaires used in the survey. The multistage sampling technique was used in data collection. The purposive sampling technique was used to select

the Nanumba North district for the study as well as the 5 communities, namely: Kpambi, Ganguyili, Demanayili, Makayili and Lanja. Subsequently, structured questionnaires were administered to 150 households (30 questionnaires in each community), using both the purposive and random sampling techniques.

# CHAPTER FOUR: ANALYSIS AND DISCUSSION

## 4.1 Introduction

This chapter presents and discusses the findings of the study. It discusses the socio-economic characteristics of households, the factors influencing household food security, the constraints facing household food security and the coping strategies adopted by farm households to forestall situations of food insecurity.

## 4.2 Socio-economic Characteristics of Farm Households

The background of respondents is considered critical in any research. It helps explain the outcome of a study. To this end, some socio-economic characteristics of this study are presented in this section.

Table 4.1 presents the distribution gender, age, years of formal education and the marital status of the household head, the household size as well the as the household head's title to the farmland and membership of a farmer-based organisation.

Out of 150 households that were interviewed, 107 representing 71% of the households were headed by males while 43 households representing 29% were headed by females. This is in line Hjelm and Dasori (2012) analysis that only about 8% of households in northern Ghana are female-headed households. FAO (2012) also identifies that northern Ghana has a lower share of female-headed households as compared to male-headed households.

The average age of the household head was 40 years while the minimum and maximum ages were 19 and 70 years respectively. The average age deviates by 12 years. The range of the age of the average farmer can, therefore, be pegged between 28 and 62 years.

The maximum number of years of school attendance by the household head was 15 years which is equivalent to a tertiary level education. There were also household heads who had never attended school. The average years of education were however very low at 2 years which is not up to the 6 years required completing the basic level of education in Ghana. This trend is, however, consistent with literature as FAO (2012) identifies that though the literacy rate in Ghana is low, it is even lower in the rural areas and the northern part of the country.

**Table 4.1: Household Socioeconomic Characteristics**

Total number of households = 150

| Household Characteristics | | Count | % | Mean | Max | Min | Standard Deviation |
|---|---|---|---|---|---|---|---|
| Gender | Male | 107 | 71.3 | | | | |
| | Female | 43 | 28.7 | | | | |
| Age (years) | | | | 40.20 | 70 | 19 | 11.87 |
| Education (years) | | | | 2.02 | 15 | 0 | 4.10 |
| Household Size | | | | 10.53 | 38 | 1 | 5.48 |
| Land Title | Yes | 130 | 86.7 | | | | |
| | No | 20 | 13.3 | | | | |
| FBO | Yes | 22 | 14.7 | | | | |
| | No | 128 | 85.3 | | | | |
| Marital Status | Single | 4 | 2.7 | | | | |
| | Married | 139 | 92.7 | | | | |
| | Widowed | 4 | 2.7 | | | | |
| | Divorced/ separated | 3 | 2.0 | | | | |

Source: Computation from survey data, 2015.

The household types ranged from a one-person household to a household with the size of 38 individuals. The average household consisted of 11 people. This is slightly higher than (GSS, 2014b) which pegs the average household size of the Nanumba North district at 8.4 for rural households in the district.

The majority of the household heads (139 representing 93%) were married. There were 4 households (3%) with the household heads being single and 4 households (3%) with household heads being widowed. There were 3 households with the household heads divorced or separated. This is also consistent with the findings of (GSS, 2014b) which identified that over 50% of the population in the district was married.

**4.3. Food Security Status of Farm Households**

Categorising household food security status was done in two stages. The first stage grouped households into four clusters: food secure, marginally food insecure, moderately food insecure and severely food insecure. Table 4.2 and Figure 4.1 provide further details.

**Table 4.2: Farm Household Food Security Status A**

| Food Security Status | Frequency | Percent |
|---|---|---|
| Food secure | 53 | 35.3 |
| Marginally food insecure | 10 | 6.7 |
| Moderately food insecure | 36 | 24.0 |
| Severely food insecure | 51 | 34.0 |
| Total | 150 | 100.0 |

Source: Computation from survey data, 2015.

**Figure 4.1: Household Food Security Status A**
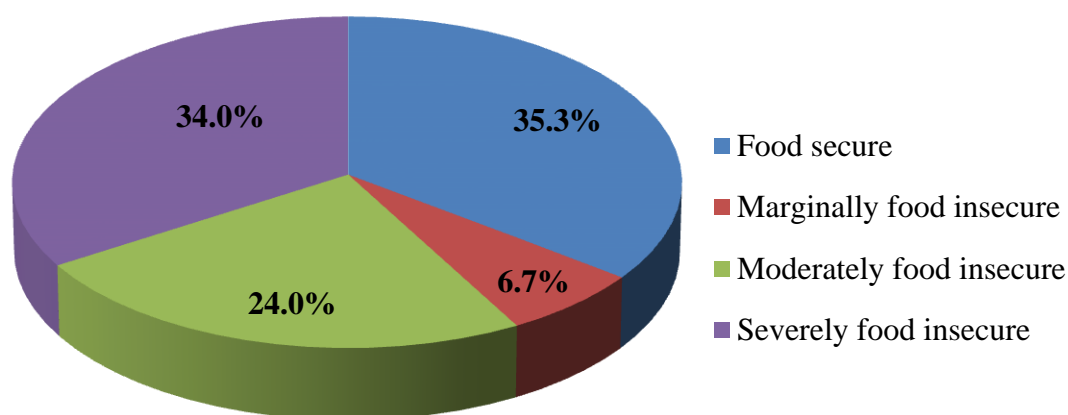


Source: Computation from survey data, 2015.

From Table 4.2 and Figure 4.1, out of the sample of 150 households, 53 households representing 35% of the sample were food secure. These households showed no indication of difficulty with food access. 10 households representing 7% were marginally food insecure, showing minimal indication of difficulty with food access. 24% (36) of households showed indications of compromised quality and quantity of food consumed and were categorised as

moderately food insecure. 34% of households representing 51 households experienced reduced food intake and disrupted eating behaviours and were considered as severely food insecure households.

The second stage condensed these initial groupings into two basic groups of food secure and food insecure households. This is presented in Table 4.3 and graphically in Figure 4.2.

Table 4.3: Farm Household Food Security Status B

| Food Security Status | Frequency | Percentage (%) |
|---|---|---|
| Food insecure | 87 | 58.0 |
| Food secure | 63 | 42.0 |
| Total | 150 | 100.0 |

Source: Computation from survey data, 2015.

**Figure 4.2Household Food Security Status B**
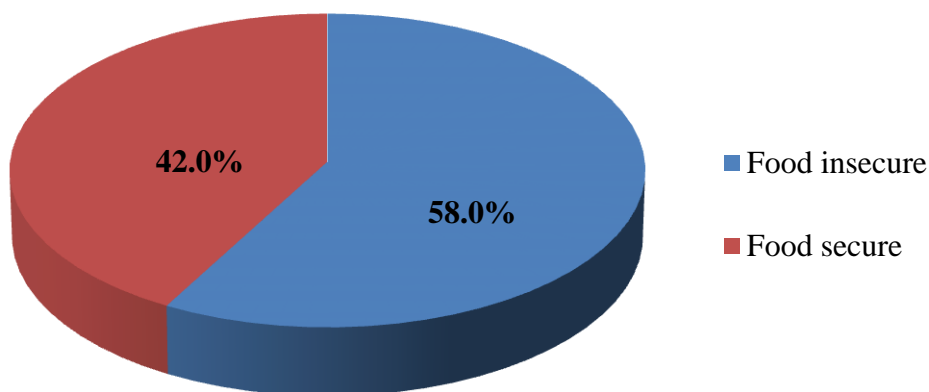


Source: Computation from survey data,

From Table 4.3 and Figure 4.2, there were more food insecure households in the communities than food secure households. 42% (63) of households were food secure. These households showed either no indication or minimal indication of difficulty with food access. However, 58% (87) households were food insecure, showing indications of compromise in the quality and quantity of food consumed or reduced food intake and disrupted eating patterns.

**4.4 Household Socio-Economic Characteristics and Food Security Status**

Table 4.4 provides a summary of the frequencies and percentages of the socio-economic characteristics of farm households in relation to the food security status of households. It includes the distribution of the household head's gender, level of education attained, marital status, land ownership status, household membership of FBO, as well as the household's access to credit and extension service, savings, residence tenancy status, engagement in non-farm enterprise and decision on resource use.

From Table 4.4, male-headed households are more food secure (85%) than female-headed households (14.3%). Male-headed households (61%) are also more food insecure than female-headed households (39%). The majority of food secure household heads (76%) have no education (school attendance) while 23% of food secure household heads have attended basic, secondary or primary school. Similarly, 77% of food insecure household heads have no education while 23% have attended school. In relation to marital status, the table shows that 92% of food secure household heads are married while 8% are not married. 93% of food insecure household heads are married with 7% not married. A majority of both food secure (95%) and food insecure households (81%) own their farm lands.

22% of food secure households are members of FBO while 78% are not members. 9% of food insecure household do not belong to any FBO while 91% belong to an FBO. Most food secure households (70%) and food insecure households (69%) do not have access to extension service. A greater proportion of food secure households (86%) does not have access to credit while 64% of food insecure households also do not have credit.

60% of food secure households have savings while 69% of food insecure households do not have savings. Most food secure households (91%) own the houses they occupy, 2% live in rented houses while 8% live in rent-free houses. 59% of food secure households are engaged in a non-farm enterprise, 41% are not while 33% of food insecure households are engaged in non-farm enterprise and 67% are not. With regards to household resource use decisions, most food secure households (71%) as well as food insecure households (70%) had the household head solely making decisions. Lastly, no food secure household had the spouse of the household head being the only decision maker.

Table 4.4: Cross-tabulation of Socio-Economic Characteristics and Food Security Status of Households

| Socio-Economic Characteristics | Food Secure | | Food Insecure | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| **Gender (HHH)** | | | | |
| Male | 54 | 85.7 | 53 | 60.9 |
| Female | 9 | 14.3 | 34 | 39.1 |
| **Education (HHH)** | | | | |
| None | 48 | 76.2 | 67 | 77.0 |
| Basic, Secondary & Tertiary | 15 | 23.8 | 20 | 23.0 |
| **Marital Status (HHH)** | | | | |
| Married | 58 | 92.1 | 81 | 93.1 |
| Not Married (Single, Widowed) | 5 | 7.9 | 6 | 6.9 |
| **Land Ownership (HH)** | | | | |
| Yes | 60 | 95.2 | 70 | 80.5 |
| No | 3 | 4.8 | 17 | 19.5 |
| **Membership of FBO (HH)** | | | | |
| Yes | 14 | 22.2 | 8 | 9.2 |
| No | 49 | 77.8 | 79 | 90.8 |
| **Access to Extension Service (HH)** | | | | |
| Yes | 19 | 30.2 | 27 | 31.0 |
| No | 44 | 69.8 | 60 | 69.0 |
| **Access to Credit (HH)** | | | | |
| Yes | 9 | 14.3 | 31 | 35.6 |
| No | 54 | 85.7 | 56 | 64.4 |
| **Savings (HH)** | | | | |
| Yes | 38 | 60.3 | 27 | 31.0 |
| No | 25 | 39.7 | 60 | 69.0 |
| **Present Occupancy of House (HH)** | | | | |
| Owned | 57 | 90.5 | 76 | 87.4 |
| Rented | 1 | 1.6 | 0 | 0.0 |
| Rent free | 5 | 7.9 | 11 | 12.6 |
| **Non-farm enterprise (HH)** | | | | |
| Yes | 37 | 58.7 | 29 | 33.3 |
| No | 26 | 41.3 | 58 | 66.7 |
| **Resource Use Decisions (HH)** | | | | |
| HHH only | 45 | 71.4 | 61 | 70.1 |
| Spouse of HHH | 0 | 0.0 | 2 | 2.3 |
| HHH & Spouse | 17 | 27.0 | 22 | 25.3 |
| HHH, Spouse & Children | 1 | 1.6 | 2 | 2.3 |

Source: Computation from survey data, 2015.

## 4.5 Factors Influencing Household Food Security Status

Table 4.5 provides the results of the binary logistic regression of the socioeconomic factors influencing the food security of small-scale farm household.

Table 4.5: Logistic Regression of Factors Affecting household food security

| Variables | Coefficients | Standard Error | P- values | Marginal Effect (dy/ dx) |
|---|---|---|---|---|
| Gender (HHH) | -1.256 | 0.516 | 0.015** | -0.276 |
| Age (HHH) | 0.008 | 0.019 | 0.689 | 0.002 |
| Education (HHH) | 0.088 | 0.536 | 0.870 | 0.021 |
| Household size | 0.013 | 0.037 | 0.727 | 0.003 |
| FBO (HH) | -1.341 | 0.666 | 0.044** | -0.323 |
| Credit (HH) | 1.757 | 0.566 | 0.002*** | 0.362 |
| Savings (HH) | -0.787 | 0.463 | 0.090* | -0.189 |
| Farm Size (HH) | 0.028 | 0.056 | 0.610 | 0.007 |
| Non-Farm Enterprise (HH) | -1.009 | 0.460 | 0.028** | -0.241 |
| Total Revenue (HH) | 0.000326 | 0.000 | 0.073* | 0.000 |
| Const. term | -0.243 | 1.263 | 0.847 | |
| Pseudo $R^2$ | 0.245 | | | |
| LR Chi2 (10) | 50.05 | | | |
| Prob>Chi2 | 0.0000 | | | |
| Log likelihood | -77.0199 | | | |

Source: Computation from survey data, 2015

From the table, some of the variables had positive coefficients (age of household head, education of household head, household size, etc.) while others had negative coefficients (membership of an FBO, household savings, the gender of the household head, etc.). For the variables with positive coefficients, an increase in the value of the variable increases the household's probability of being food secured. Likewise, for variables with negative coefficients, an increase in the value of the variable reduce the household's probability of being food secure.

From the regression analysis, the following household socio-economic characteristics were significantly influencing the household food security status at 1%, 5%, and 10% significance levels: Access to credit (p=0.002) the gender of the household head (p = 0.015), membership

in a FBO (p = 0.044), household savings (p = 0.090), household engagement in a non-farm enterprise (p = 0.364) and the total revenue from farming activity (p=0.073).

With the exception of the total household revenue from farming which recorded a marginal effect of 0%, the remaining significant characteristics had marginal effects ranging between 19% and 36%. The age of the household head, years of school attendance, household size and farm size were found to be non-statistically significant.

Household access to credit has a significant influence on household food security of farm households. It recorded a positive influence on household food security with a marginal effect of 0.36. This result shows that farm households having access to credit facilities are more likely to be food secure and that when a household has access to credit, the probability of being food secure increases by approximately 36%. This is in line with the view expressed by Babatunde *et al.* (2007), that access to credit (consumption credit) increases the household's purchasing power and access to food. Kuwornu *et al.* (2011) also recorded a similar relationship in a study of farm households in the forest belt of Ghana.

The study further identified that the household's total revenue from farming also significantly influences the farm household's food security status. Total revenue positively influences household food security. This means that households that earn more from farming are likely to be food secure. If a household generates more income from farming, it will be able to buy inputs to improve productivity as well as provide a more balanced diet for the household members (Babatunde *et al.*, 2007; Arene & Anyaeji, 2010). An increase in household income also has a direct impact on the household access to food (Kuwornu *et al.*, 2011).

A household's membership in an FBO also has a significant impact on farm household food security. Membership in an FBO however negatively affects food security. This means that if a farm household belongs to an FBO, it is less likely to be food secure. This is quite a surprising outcome as many studies provide a positive relationship between this factor and food security. Babatunde et al (2007) for instance explains that such cooperatives increase a farmer's access to credit. The result from the study could also point to the possibility that the FBO's in these communities are non-functional or are not able to provide the needed support to its members. Household membership in an FBO had a marginal effect of 0.032. This means that when a household belongs to an FBO, the probability of being food secure reduces by approximately 32%.

A household's engagement in a non-farm enterprise also significantly impacts farm household food security. The impact is also negative, meaning that farm households that engage in a non-farm enterprise are likely to be food insecure. The probability to be food secure reduces by approximately 24% (marginal effect) when the household engages in a non-farm enterprise. Participating in a non-farm enterprise can be demanding and farmers may not have time to concentrate on food production. The wage earned from this activity may also not be sufficient to compensate for the sacrificed farm income (Kuwornu *et al.*, 2011). Ojeleye *et al.* (2014) however identify an opposing result to this in his study among small-scale farm households in Nigeria. He concludes that income generated from non-farm enterprises (non-farm income) was of great benefit to farm household food security.

The gender of the household head also has a significant and negative effect on farm household food security. Male-headed households are more likely to be food insecure than female-headed households. If the household head is a male, the probability of the household being food secure is reduced by approximately 28% (marginal effect). This result is contrary to findings from other studies where households with female heads are more likely to be food insecure (FAO, 2012; Hjelm and Dasori, 2012).

Household savings also have a significant and negative influence on food security of farm households. Therefore, farm households that had savings are less likely to be food secure. The probability of being food secure is reduced by 19% (marginal effect) when the household saves. Adams (1978) highlights on the possibility that greater incentives for household savings can discourage household consumption. Households are likely to alter their consumption patterns in order to save money. For instance, the need to settle the tuition fees of children and other household expenses sometimes forces households to save money for this purpose, which can sometimes compromise household food security.

## 4.6 Constraints Facing Farming Households in Achieving Food Security

From Table 4.6, unfavourable climate with an average score of 52 received the highest rank by respondents as the major delimiting factor to achieving household food security. Destruction of harvest ranked as the second most important constraint with an average score of 50 while high fuel cost ranked third with an average score of 44.41. High food price and debts to reimburse ranked fourth and fifth which average scores of 43 and 34 respectively. The least ranked constraint is death or sickness in the household with an average score of 33.

As evident from the data, the unfavourable climate is the most delimiting factor for small-scale farmers in the surveyed communities. This is likely due to the comparatively low rainfall experienced in Northern Ghana. Additionally, unlike the Southern part of the country which experiences a double annual maxima rainfall, the Northern savannah climatic zone has one rainfall season, limiting rain-fed agricultural activity. The increasing climate variability is, therefore, likely to intensify the challenges households face in securing food as farm household lack the capacity to adapt to the change (Rosegrant and Cline, 2013).

Table 4.6: Constraints Facing Household Food Security

| Factors | Average Scores | Ranks |
|---|---|---|
| Unfavourable climate | 52.41 | 1 |
| Destruction harvest | 50.43 | 2 |
| High fuel cost | 44.41 | 3 |
| High food price | 42.63 | 4 |
| Debts to reimburse | 34.39 | 5 |
| Death or sickness in the household | 32.62 | 6 |

Source: Computation from survey data, 2015

The destruction of harvest was also identified as an important constraint to household food security. The Nanumba North District lies within the flood plains of northern Ghana which are plagued with annual floods which destroy farmlands and housing infrastructure. This is a likely explanation for the relevance of this constraint to the people.

**4.7 Coping Strategies Adopted by Farm Households**

Table 4.7 provides a list of ten coping strategies often used by households in situations of food insecurity. From the table, the two major coping strategies adopted by households are purchasing cheaper food which ranked first with an average score of 62 and reducing the quantity of meals eaten, ranked second with an average score of 62. Reducing the quantity of meals eaten, decreasing the number of adult meals so that children have enough food to eat and exchanging one type of food for another were ranked third, fourth and fifth with average scores of 55, 54 and 53 respectively.

Buying food on credit ranked sixth having an average score of 52. Borrowing of food ranked seventh with an average score of 47 and borrowing money to food ranked eighth with an average score of 42. Less popular coping mechanisms involved sending children to relative's house to eat and selling household assets to purchase food. These ranked ninth and tenth, with average scores of 39 and 33 respectively.

Table 4.7: Coping Mechanisms used by Farm Households

| Coping Mechanisms | Average Scores | Ranks |
|---|---|---|
| Purchase cheaper food | 62.44 | 1 |
| Reduce the number of times meals are eaten | 61.78 | 2 |
| Reduce the quantity of meals eaten | 54.80 | 3 |
| Reduce quantity of adult meal so children can have food to eat | 53.37 | 4 |
| Exchange one type of food for another | 53.16 | 5 |
| Buy food on credit | 52.46 | 6 |
| Borrowing of food | 47.17 | 7 |
| Borrowed money to buy food | 41.97 | 8 |
| Send children to eat at relatives house | 39.17 | 9 |
| Sell household assets to purchase food | 32.61 | 10 |

Source: Computation from survey data, 2015

From the study, household's first step at mitigating food insecurity is to opt to eat less preferred food. Less expensive foods such as "gari" and "konkonte" are consumed (Kuwornu *et al.*, 2011). It is evident that selling household assets to buy food is the least likely strategy to be used by households when their food security status in challenged. This confirms the literature that in fact in that in choosing coping strategies, often the preservation of assets (personal items such as jewellery and household assets such as furniture) takes priority over meeting immediate food needs (Moser, 1998; Kinsey, 1998).

# CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSION

## 5.1 Introduction

This chapter provides a summary of the findings of the study and policy recommendations which will support small-scale farm households to be food secure.

## 5.2 Conclusion

The results from the study show that a farm household's access to credit and total revenue from farming positively influences household food security. Farm households are more likely to be food secure when they are provided with credit support and when they have higher revenue from farming. When farmers have timely access to credit, they can increase their production which will boost their income from farming in the long run. With a good harvest and an increased income from farming, small-scale farm households will be able to provide the food needs of its household members. However, from the study, only 40 households (27%) had access to credit. By increasing credit facilities in these communities, more households can become food secure.

On the contrary, when small-scale farm households save, belong to an FBO or engage in non-farm economic activities, they are likely to be food insecure. In the study, 65 households (43%) had savings. 60% of food secure households had savings while 69% of food-insecure households did not have savings. The fact that a household that saves is likely to be food insecure could mean that such households are saving at the expense of meeting their household food needs. This raises concerns of what could be the factors warranting such trends and would need to be researched on.

Furthermore, when a farm household belongs to an FBO it is also likely to be food insecure. Only 15% of the sampled households belong to FBOs. A majority of both food secure (78%) and food insecure (91%) households do not belong to FBOs. FBOs often serve as support groups for farmers, and membership in such organisations should have a positive influence on farm households. The negative influence could be an indication of the weakness of FBOs in these communities. It is evident from the study that only a few small-scale farm households belong to FBOs and this supports the assumption that FBOs are likely to be non-functional in these communities. They need to be supported so that members can benefit from them.

Households engaged in non-farm activities are also not likely to be food secure. 66 66 households (44%) in the study were involved in a non-farm enterprise. 59% of food secure households were engaged in the non-farm enterprise while 41% were not. However, 33% of food insecure households were engaged in the non-farm enterprise while 67% were not. For the sampled communities, it is better for farm households to concentrate on farming since that gives them a probability of being food secure than when they partially engage in non-farm activities.

Female-headed households constitute 29% of the sample while male-headed households make up 71%. However, the study showed that male-headed households were likely to be food insecure than female-headed households. Empowering females in these communities could, therefore, have a significant influence on achieving household food security.

Critical to examining the food security of households is an analysis of the constraints to household food security. The most important constraints identified by respondents to affect their household food security were unfavourable climate, destruction of harvest and high fuel cost. This analysis further engrains the great impact climate has on agriculture in Africa and the need to support rural farmers to overcome challenges created by climate change. Other relevant constraints to farming household food security are the destruction of harvest and high fuel cost.

Food security coping strategies represent efforts by households to adapt to situations of food insecurity. The most important coping strategies that households had used or were likely to use include purchasing cheaper food and reducing the frequency and quantity of meals eaten. Purchasing cheaper food, however, mean purchasing foods that may not meet the human energy needs of the household. These strategies, when used over time, could compromise the health and wellbeing of the household members especially children in their developmental years and pregnant women.

## 5.3 Policy Recommendations

Mechanisms should be put in place to provide small-scale rural farmers with soft loans to support their farm activity. Credit must be provided timely if it is to have an impact on farm activity. In providing credit, it is important to do an assessment of the recipients and factor in the possibility of providing consumption credit to households where necessary.

Small scale rural farmers must also be supported to improve the productivity of their farm activity as this will ensure food security in their homes. Such support should focus on both the farming process and the marketing of farm produce.

Small-scale farmers must be encouraged to form or join FBOs. The FBOs must also be supported by the government, civil society organisations, and non-governmental organisations. These institutions must work towards strengthening FBOs, especially among rural and vulnerable farming communities. FBOs serve as excellent intermediaries in supporting the activities of small-scale farmers and efforts must be made to harness this.

Households in rural communities, especially vulnerable households facing challenges in securing sufficient food must be provided with consumption credit to ensure the food security of such households.

Climate change adaptation programmes must channel efforts at supporting rural farmers who often have limited capacity of dealing with climate extremes. Here, the FBOs will serve as good points of contact to reach out to many farmers in such programmes.

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