

**ACCESS TO AGRICULTURAL PRODUCTION RESOURCES AND ITS EFFECT
ON THE HOUSEHOLD FOOD SECURITY OF SMALLHOLDER WOMEN MAIZE
FARMERS IN THE TECHIMAN MUNICIPALITY AND OFFINSO NORTH
DISTRICT OF GHANA**

BY

HANNAH NYAMEKYE

Thesis submitted to the Department of Agricultural Economics and Extension, School of Agriculture, University of Cape Coast, in partial fulfillment of the requirements for the award of Doctor of Philosophy Degree in Agricultural Extension

JULY, 2015

UNIVERSITY OF CAPE COAST

ACCESS TO AGRICULTURAL PRODUCTION RESOURCES AND ITS EFFECT
ON THE HOUSEHOLD FOOD SECURITY OF SMALLHOLDER WOMEN MAIZE
FARMERS IN THE TECHIMAN MUNICIPALITY AND OFFINSO NORTH
DISTRICT OF GHANA

HANNAH NYAMEKYE

2015

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Name: Hannah Nyamekye

Signature:.....

Date:.....

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Name: Prof. Edward Ntifo-Siaw

Signature:..... Date:.....

Co-Supervisor's Name: Dr. Albert Obeng Mensah

Signature:Date:.....

ABSTRACT

The study investigated access to agricultural production resources and its effect on the household food security of smallholder women farmers in the Techiman Municipality and Offinso North District of Ghana. The study was a descriptive correlation research. A validated interview schedule was used to solicit primary data from three hundred (300) women farmers. Data were analyzed using univariate and parametric statistics. The major findings were that, farmers' level of access to agricultural production was in the "low access" and "moderate access" categories for Offinso North District and Techiman Municipality respectively which was statistically insignificant.

A statistically insignificant differences in maize yield were observed for respondents in the both study areas. Respondents contributed a percentage of their maize yield to their household with 20-29 percent bracket recording the highest. Respondent's food security status lied on a continuum from "very low" to "high" food security status with only 2.3 percent within the "very low" food security category. A statistically positive relationship was observed between level of access to agricultural production resources and the household food security status of respondents. The most predominant coping strategy adopted by respondents to meet their household food security needs were the production and sale of crops.

The study recommends to the Department of Agriculture and NGOs working in the Offinso North District and Techiman Municipality, to implement programmes that targets the provision of women farmers with agricultural production resources such as fertilizers, pesticides, improved seeds, tractor services, extension services, weedicides, hired labour and land.

ACKNOWLEDGEMENTS

I express my deep gratitude to my supervisors, Prof. Edward Ntifo-Siaw and Dr. Albert Obeng Mensah, for their continuous encouragement and skillful guidance, constructive comments and useful suggestions that transformed every piece of my efforts into this dissertation. I give special thanks to Prof. Annor Frimpong for his support during the preparation and finalization of this thesis.

Many thanks go to the Agricultural Extension Officers, Mr. Abdulia Salifu, Mr Ketor Kobla and Miss Felicia Akudaga, for their assistance during my field work. I extend my heartfelt thanks to the Staff and Lecturers in the Department of Agricultural Extension and Economics, University of Cape Coast, for their encouragement during my study.

DEDICATION

To my children Pearl Ekuah Acquah and James Delali Acquah.

TABLE OF CONTENTS

Title	Page
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
DEDICATION	v
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ACRONYMS	xiii
CHAPTER ONE: INTRODUCTION	1
Background to the Study	1
Statement of the Problem	11
Objectives of the Study	12
Variables of the Study	13
Research Questions	13
Hypotheses	15
Significance of the Study	16
Delimitation of the Study	17
Organization of the Study	18
Definition of Key Terms	18
CHAPTER TWO: LITERATURE REVIEW	20
Introduction	20
Importance of Maize to the Ghanaian Economy	21
Constraints and Opportunities for Subsistence Smallholder Farming	22
Role of Farmers Based Organisations in Supporting Smallholder Farmers	23

Brief History of Farmer Based Organizations	24
Empirical Evidence of Women Farmers Access to Agricultural Production Resources and its Effect on Yield	28
Theoretical Framework	32
Food Availability Decline Theory (FAD)	32
Climate Theory	34
Food Entitlement Decline Theory (FED)	35
Government Policy Theory	38
Farm Household Production Theory	39
Economic Theories of Farm Household Production Choices	40
Profit Maximizing Peasant Theories	40
The Utility Maximization Theories	42
The Risk Averse Peasant Farmer	44
Theoretical Perspective of Women’s Empowerment in Agricultural Production	46
Food Security Definitions and Concepts	51
Food Security Definitions	51
Global Food Security	57
National Food Security	59
Linkage Between Food Security and Livelihood Security	60
Food Insecurity Concepts	65
Household Definitions and Household Food Security Concepts	70
Household Definitions	70
Gender and Household Food Security	73
Linkage between Subsistence Production and	

Household Food Security	74
Determinants of Household Food Security	75
Measuring Household Food Security	80
Role of Women in Ensuring Household Food Security	85
Government Policy Supporting Women Farmers in Ghana	85
Challenges to Food Security in Africa	88
Efforts by Governments in Africa to Ensure National Food Security	89
Achieving Food Security in Ghana	91
Coping Strategies Adopted by Households in Meeting their Food Security Needs	94
Conceptual Framework of the Study	98
Agricultural Policy	99
Farmer Based Organization	100
Access to Agricultural Production Resources	102
Mitigation of Production Risk	102
Increases in Crop (Maize) Yield	103
Engagement in On-farm and Off -farm Paid Jobs for Income	103
Contribution of Sale of Farm Produce for Income to Household Food Security	106
Characteristics of Farmer Contributing to Household Food Security	106
Use of Farm Produce (Maize) for Food Consumption	107
Household Food Security	107
CHAPTER THREE: METHODOLOGY	109
Introduction	109
Study Area	109

Offinso North District in the Ashanti Region of Ghana	109
Techiman Municipality in the Brong Ahafo Region of Ghana	112
Research Design	113
Study Population	114
Sample and Sampling Procedure	114
Instrumentation	116
Data Collection	120
Data Analysis	120
CHAPTER FOUR: RESULTS AND DISCUSSION	123
Introduction	123
Characteristics of Respondents	123
Age Composition of Respondents	123
Marital Status of Respondents	124
Educational Background of Respondents	125
Land Holdings of Respondents	127
Household Size of Respondents by Marital Status	128
Women in Leadership Positions within FBOs	130
Level of Access to Agricultural Production Resources by Smallholder Women Farmers Engaged in Maize Production	130
Level of Access to Land	132
Level of Access to Tractor Services	133
Level of Access to Extension Services	134
Level of Access to Weedicide	135
Level of Access to Hired Labour	136
Level of Access to Pesticides	137

Level of Access to Fertilizer	137
Level of Access to Certified Seeds	138
Yield Levels of Smallholder Women Maize Farmers	138
Percentage of Maize Yield Contributed to their Households	140
Household Food Security Status of Respondents	142
Effect of Access to Production Resources on the Household Food Security Status of Respondents	143
Age of Respondents by Household Food Security Status	145
Farm Land Size and Household Food Security of Respondents	146
Household Food Security Coping Strategies Adopted by Respondents	146
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	
RECOMMENDATIONS	149
Introduction	149
Summary	149
Characteristics of Respondents	151
Respondents Level of Access to Agricultural Production Resources	152
Yield Levels of Smallholder Women Farmers	153
Contribution of Maize Yield to the Household	154
Household Food Security Status of Respondents	154
Access to Productive Resource and Household Food Security of Respondents	154
Coping Strategies Adopted by Respondents in Meeting their Household Food Security	155
Conclusions	155
Recommendations	158

Further Research	160
REFERENCES	161
APPENDIX	184

LIST OF TABLES

Table		Page
1	Range of Food Security in the Household	84
2	Number of Respondents Interviewed in the Study Areas	116
3	Reliability Co-efficient of Subscale of the Research Instrument	119
4	Age of Respondents	124
5	Land Holdings of Respondents by Study Areas and Independent t-test for a Difference in Land Size	127
6	Household Size of Respondent by their Marital Status	129
7	Differences in Household Size of Respondents	130
8	Level of Access to Agricultural Production Resources	131
9	Yield Levels of Respondents for year 2010 and 2011	139
10	Percentage of Maize Yield Respondents Contribute to their Household	141
11	Household Food Security Status of Respondents	142
12	Access to Production Resource on the Household Food Security Status of Respondents	144
13	Chi-Square Test for Association between Access to Production Resources and Household Food Security Status of Respondents	144
14	Age of Respondents and Household Food Security Status	145
15	Farm size by Household Food Security Status of Respondents	146
16	Coping Strategies Adopted by Respondents	148

LIST OF FIGURES

Figure		Page
1	Conceptual Framework	101
2.	Map of Offinso North District Showing Study Areas	110
3	Map of Techiman Municipality Showing Study Areas	113
4	Marital Status of Respondents	125
5	Educational Status of Respondents by Study Areas	126

LIST OF ACRONYMS

AEA	Agricultural Extension Agent
AAGDS	Accelerated Agricultural Growth and Development Strategy
ADRA	Adventist Development Relief Agency
AGRA	Alliance for a Green Revolution in Africa
APFOG	Apex Farmers Organization of Ghana
AR	Ashanti Region
BA	Brong Ahafo Region
CAADP	Comprehensive African Agricultural Development Programme
CRS	Catholic Relief Services
CSIR	Council for Scientific and Industrial Research
FAD	Food Availability Decline
FAO	Food and Agricultural Organization
FASDEP	Food and Agricultural Sector Development Policy
FBO	Farmer Based Organization
FED	Food Entitlement Decline
FO	Farmers Organization
FONG	Farmers Organization Network in Ghana
GADS	Gender and Agricultural Development Strategy
GASIP	Ghana Agricultural Sector Investment Programme
GDP	Gross Domestic Product
GLSS	Ghana Living Standard Survey
GNAFF	Ghana National Association of Farmers and Fishermen
GPRS	Ghana Poverty Reduction Strategy
GSGDA	Ghana Shared Growth Development Agenda

HFSM	Household Food Security Measure
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IFDC	International Centre for Soil Fertility and Agricultural Development
METASIP	Medium Term Agriculture Sector Investment Programme
MoFA	Ministry of Food and Agriculture
MT	Metric Tonne
NFFWED	National Farmers and Fishermen Award Winners Association
NGO	Non-Governmental Organization
NDPC	National Development Planning Commission
PFAG	Peasant Farmers Association of Ghana
SARI	Savanna Agricultural Research Institute
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
UN	United Nations
US	United States
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WCED	World Commission on Environment Development
WIAD	Women in Agricultural Development

CHAPTER ONE

INTRODUCTION

Background to the Study

In Ghana, agriculture contributes about 40% to the Gross Domestic Product (GDP), providing the raw material base for industrial activities and livelihood to a significant segment of the population particularly smallholder farmers (MoFA, 2005). Ghana's economy has been largely dependent on agriculture and its growth is a key to overall economic growth and development. The first Ghana Poverty Reduction Strategy (GPRS I), from 2003-2005 set out that agriculture was to be modernized to spur rural development. Similarly, the GRPS II also recognized that, no significant progress could be made in raising the average real incomes of Ghanaians as a whole without significant improvements in the productivity of the agricultural sector and agro-based/processing industry (MoFA, 2005).

The Ghana Shared Growth and Development Agenda I (GSGDA I), 2010-2013, established that agriculture is expected to lead the growth and structural transformation of the economy and maximize the benefits of accelerated growth (MoFA, 2005). It is worth mentioning that, the strategic direction for the medium-term development as stated in the GSGDA II, from, 2014-2017 has four pillars of Government's Development Policy Agenda with pillar two focusing on a strong and resilient economy, which covers the

thematic areas of ensuring and sustaining macroeconomic stability; enhancing competitiveness of Ghana's private sector; accelerating agriculture modernization and sustaining natural resource management. Thus, over the medium-term, the agriculture sector is envisaged to play a critical role in the transformation of the country's economy. The prospects for accelerated transformation of the economy lies in the opportunities that exist in agriculture for selected crops development for food security, import substitution, agro-industrial raw materials for agro-processing, and export (MoFA, 2010).

The contribution of the agricultural sector to GDP over the six years of Medium Term Agriculture Sector Investment Programme (METASIP) implementation has experienced a nosedive until 2011 and an upward trend thereafter. Though estimates show an improvement in the growth rate of the agricultural sector (5.2%) in 2013 compared to 2012 (2.3%), its contribution to the economy continues to decline, with its share reducing marginally from 23 percent of GDP in 2012 to 22.6 percent in 2013 (MoFA, 2013).

Agriculture in Ghana is basically a rural activity and agricultural commodities produced in the country can be classified into three groups relevant for the economy: foodstuffs for local consumption, raw materials for local industry, and commodities for foreign markets. The majority of Ghanaians who are engaged in agriculture consist of smallholder farmers. Agriculture therefore offers the greatest potential for spearheading a wide scale of poverty reduction strategy in Ghana. Governments, having realized this, have placed emphasis on the modernization of agriculture as a basis for industrialization, and as a driver of accelerated economic growth (MoFA, 2013).

According to MoFA (2009), the key problems that have plagued the agricultural sector include: (a) Inadequate credit and high interest rate, (b) The traditional land tenure system and the limits it imposes on large-scale commercial agriculture, (c) Low returns to investment and persistence of subsistence agriculture with its attendant low productivity, (d) Lack of adequate infrastructural investment in agriculture, and related limited appropriate technologies and low adoption of improved technologies; (e) Lack of proper and consistent management of post harvest activities, and (f) Poor “linkages” between agriculture and industry through backward and forward production linkages; consumption linkage effects, capital and labor linkages, to enhance growth.

The failure to achieve the set growth targets despite increased investments in agriculture reflects the numerous challenges that impede the sector’s development. The potential to improve the state of agriculture in Ghana is huge. It has been estimated that, Ghana’s agriculture is operating at about 20% of its full potential. These challenges therefore need to be addressed if the goal of achieving a higher level of economic development through a modernized agriculture is to be realized. The country’s agriculture is characterized by low crop and animal productivity. Yields of most crops are generally low with most yields about 60% of achievable yields. A major reason for the non-attainment of achievable yields is the low fertility of the soils which is partly due to low use of fertilizers. Other factors contributing to the low levels of yield is largely attributed to the type and quality of inputs used, the poor extension network, and inadequate moisture for plant growth. In furtherance to this, the average food-crop producer is resource poor and

therefore uses little fertilizer, insecticides, high yielding varieties or irrigation based cultivation (MoFA, 2010).

The low level of agricultural productivity has been a major concern in the country's agricultural development for several decades. As a result, the Ministry of Food and Agriculture (MoFA) is implementing the Food and Agricultural Sector Development Policy (FASDEP II) to address the challenges faced by farmers who account for about 80% of domestic production. FASDEP II is a holistic and comprehensive policy framework that seeks to modernise Ghana's agricultural sector and to increase the yield of farmers of which the majority are women. FASDEP II is linked to the regional development agenda of the Comprehensive Africa Agricultural Development Programme (CAADP) to boost agricultural production (MoFA, 2005).

Due to the importance of women in agricultural production and the need to address their challenges, the Women in Agricultural Development Directorate (WIAD) was established. WIAD is one of the seven technical directorates of the Ministry of Food and Agriculture (MoFA) to ensure the implementation of policies which are beneficial to women farmers, processors in the rural, suburban and urban communities. Despite policy makers and planner are becoming increasingly aware of the crucial contributions of women farmers to agricultural production and food security, nevertheless, agricultural policies on the whole still do not address the production resources needs of women farmers adequately (MoFA, 2010).

In Ghana, the key production resources for maize production are land, fertilizer, weedicide, herbicides, tractor services, extension services, labour and improved seeds. Contrary to the perception that smallholder farmers often do

not require the use of tractor services due to the small nature of their farm sizes, increasing but gradually, smallholder farmers are employing the use of tractor services for traction (MoFA, 2010).

In a study conducted by Sarpong (2010), 59.95% indicating a total of 407 smallholder farmers interviewed in the Greater Accra, Northern, Upper East and Upper West Regions, only used tractor services because very few women are capable of hiring tractor services for their production activities. It however, imposes additional production cost on the farmers, especially if the use of tractor services is not subsidized. The use of improved fertilizer is generally low in Ghana and among smallholder subsistence farmers.

The use of fertilizer by farmers depends on two things: whether fertilizer is available in their area in a timely fashion and whether the farmer has the resources to purchase fertilizer. The impact of fertilizer use on productivity also depends on whether farmers apply it appropriately on their fields (Sarpong, 2010).

To improve fertilizer usage by farmers, the Government of Ghana introduced the fertilizer programme in 2007 as part of measures to increase agricultural productivity and to boost the livelihoods of farmers in the country. The two development partners that financed the programme were the World Bank and African Development Bank. In 2008, the government initially subsidized 43, 000 MT of fertilizer, which had risen to 150, 000 MT for the year 2011. However, following challenges confronting the economy of Ghana, coupled with the smuggling of fertilizer by dealers across the country, in 2013 the government decided to withdraw the subsidy to discourage the practice (MoFA, 2013).

Land is the most important asset for households that depend on agriculture for their livelihoods. Evidence illustrating gender inequalities in access to land is overwhelming. Women across all developing countries including Ghana are consistently less likely to own land and are less likely to have access to rented land. The land they normally have access to is often of poorer quality and in smaller plots. Access to land is a basic requirement for farming and control over land is synonymous with wealth, status and power in many areas (MoFA, 2010).

Strengthening women's access to and control over land, is an important means of raising their status and influence within households and communities. Improving women's access to land and security of tenure has direct impacts on farm productivity, and can also have far-reaching implications for improving household welfare (Allendorf, 2007).

Extension services are vital in providing advice and training to farmers to improve food production and household income. Farmers can improve their yield by accessing training or information on best farming techniques. Access to extension services by farmers appear to be very low, though estimates vary widely. A recent study notes that only 12 per cent of male-headed households and a minuscule of 2 per cent of female-headed households have access to extension (Meinzen-Dick, Quisumbing, Behrman, Biermayr-Jenzano, Wilde, Noordeloos & Beintema, 2011).

The study further established that, although the Ministry of Food and Agriculture had offices within the study area, yet most of the farmers had very little contact with agricultural extension officers. The women indicated that, there were no systematic programme for the extension workers to reach out to

them on their farms. Their assistance, however, could be obtained upon request to deal with any problem confronting them. Extension services are often directed towards farmers who are more likely to adopt modern innovations, for example farmers with sufficient resources in well established areas (Meinzen-Dick et al, 2011).

The study also established that, women are less likely to access resources and may be passed by extension service providers. The study further established that, the way in which extension services are delivered can constrain women farmers in receiving information. Women tend to have lower levels of education than men, which may limit their active participation in training that uses a lot of written material. Time constraints and cultural reservations may hinder women from participating in extension activities, such as field days outside their village or within mixed groups (Meinzen-Dick et al, 2011).

An FAO survey of extension organizations in 1993 covering 97 countries including Ghana revealed that, only 5 percent of all extension resources were directed at women. Moreover, only 15 percent of the extension personnel were females (FAO, 1993). In social contexts where meetings between women and men from outside the family nucleus are restricted, lack of female extension agents effectively bars women from participating. The preference for female extension agents varies from country to country and marital status. In Ghana, for example, male and female farmers in male-headed households have equal contact with extension agents but female farmers in female-headed households have much less contact, although they are willing to speak to agents of either sex (Doss & Morris, 2001).

Extension service agents tend to approach male farmers more often than female farmers because of the general misconception that women do not farm and that extension advice will eventually “trickle down” from the male household heads to all other household members (Meinzen-Dick et al., 2011).

Investing in agriculture is key to achieving poverty reduction and food security in developing countries including Ghana. However, financing of agriculture remains problematic, given the high risks and costs involved and the lack of proven instruments for mitigating production and credit risk, as well as the paucity of financial instruments that are adapted to the needs of smallholder farmers (MoFA, 2002).

Without access to credit especially, women farmers may be unable to bear the risks and up-front costs associated with the innovations and investments necessary to enhance their productivity, income and well-being. Accessibility to credit is necessary for the procurement of agricultural inputs, processing and marketing of agricultural produce which is critical to accelerate agricultural growth and development (MoFA, 2002).

Jazairy, Alamgir and Pannuccio (1992) states that, it is indeed very crucial for the smallholder farmers to operate with virtually no access to credit. They argue that, no matter how knowledgeable or well motivated a smallholder farmer may be, without credit, improved seeds cannot be procured, supply of necessary fertilizer and pesticides cannot be arranged, and equipment rentals or water resources developments cannot be undertaken.

Again, the reproductive roles of women usually interfere with their productive roles in terms of time for the latter. Women lack the financial capacity to hire labour to supplement their own. Another notable constraint is

exclusion from some FBOs because membership is based on land ownership (MoFA, 2009).

Ghanaian rural women constitute more than 50% of the agricultural labour force and they are responsible for the production of about 70% of the total food consumed. Despite these contributions, the role of women as producers and champions of food security is often ignored. Although women smallholder farmers often face specific challenges and barriers in their efforts to produce enough food for themselves and their families, they have not been supported sufficiently by donors or governments. The majority of women in agriculture including those engaged in maize production have limited access to land, labour, fertilizer, improved seeds, weedicide and tractor services (MoFA, 2002).

A study conducted by Strebelle and Nyamekye (2011) revealed that, women engaged in maize production in the Brong Ahafo and Ashanti Regions of Ghana had access to land, farm inputs and low access to tractor services and extension services. It is worth mentioning that, though the women farmers had access to hired labour, they complained of high cost.

This confirms the statement reported by Kent, MacRae and Tripathi (2009) that, women farmers do not have equal rights to land and they have unequal access to other production resources such as credit, skills training, technology and hired labour, therefore they do not enjoy equal economic opportunities. Women farmers' access to credit is difficult because their ability to repay loans are often underestimated, although their repayment records have consistently been superior to those of male borrowers in credit programmes available to them.

Access to production resources by farmers is very important and has a positive effect on crop yield. Although there are studies on mechanization in Africa, little emphasis in the literature has been placed on the differential access of women and men to mechanization. In many areas, smallholder farmers still rely on hand-held hoes and cutlasses for most farm work. In other areas, animal traction is used for ploughing (Asenso-Okyere & Davis, 2009).

Maize is Ghana's number one staple crop and domestic demand is growing. Between 2010 and 2015, maize demand is projected to grow at a compound annual growth of 2.6 percent. However, the country is not self-sufficient in this important staple crop, because Ghana has experienced average shortfalls in domestic maize supplies of 12 percent in recent years. Therefore, the Government of Ghana has the interest in increasing the production of this key staple crop to meet the country's growing demand and to improve food security (MoFA, 2013).

Maize production is currently dominated by smallholder farmers who rely on rain fed conditions with limited use of improved seeds, fertilizer, mechanization and post-harvest facilities. As a result, average maize yields in Ghana are well below attainable levels and post-harvest losses are high. The average annual growth in maize production for the past five years (2009 - 2013) recorded 4.9 percent. So far, year 2012 recorded the highest volume of maize production within the 5 year period, but has seen quite a remarkable reduction by 6.2% from 1.9 million metric tonnes in 2012 to 1.8 million metric tonnes in 2013 (MoFA, 2013).

The nosedive experienced in maize production in the year 2013 compared to 2012 can be attributed to delayed rainfall in some parts of the

country, especially the northern parts of Ghana, poor distribution of rainfall and prolonged dry spells that characterized the period affected the growth of early planters during the critical growth stage (tasselling) resulting in losses (MoFA, 2013).

Statement of the Problem

Ghanaian rural women constitute more than 50% of the agricultural labour force, while responsible for the production of about 70% of the total food consumed. More specifically, women farmers in Ghana often face specific challenges of access to production resources such as: access to land, hired labour, improved seeds, fertilizer, weedicide, extension and tractor services in order to produce enough food for themselves and families. These production constraints that impinge on the performance of female farmers are not peculiar but similar to those faced generally by women in West Africa (MoFA, 2013).

In Ghana, there is a long history of Government of Ghana through the Ministry of Food and Agriculture (MoFA) and some NGOs working tirelessly to ameliorate these production resources constraints to improve the yield and status of smallholder women farmers. This requires paying special attention to the conditions of women farmers to identify their production resource constraints.

Agriculture research, too, gives inadequate attention to women farmers and their needs. Although a number of studies have been done on access to production resources by women farmers, yet they only concentrate on the effect of access to production resources on yield, with very little studies on how access to production resources contributes to household food security therefore creating an information gap that needs to be filled. The study,

therefore, investigated the level of access to agricultural production resources by smallholder women maize farmers in the Techiman Municipality and Offinso North District of Ghana and its effect on their household food security.

Objectives of the Study

The general objective of the study was to investigate access to agricultural production resources on the household food security of smallholder women maize farmers in the Techiman Municipality and Offinso North District of Ghana. The specific objectives were to:

1. examine the socio-demographic characteristics of respondents in terms

of:

1. Age
2. Marital status
3. Educational level
4. Land holding
5. Household size by marital status
6. Women in leadership position within FBOs

2. determine the level of access to agricultural production resources by smallholder women farmers in the Techiman Municipality and Offinso

North District in terms of:

1. Land
2. Hired labour
3. Tractor services
4. Extension services (MoFA, NGO)
5. Fertilizer
6. Weedicide

7. Certified seeds
8. Pesticides
3. determine the yield levels of smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production.
4. investigate the percentage of maize yield contributed by smallholder women farmers to their households in the study areas.
5. determine the household food security status of smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production.
6. examine the relationship between the level of access to production resources and the food security levels of smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production.
7. find out the coping strategies adopted by the smallholder women farmers in Offinso North District and Techiman Municipality to meet their household food security needs.

Variables of the Study

The study examined access to agricultural production resource and its effect on the household food security of smallholder women maize farmers in Offinso North District and Techiman Municipality. “Household food security” was the dependent variable. On the other hand, farmers access to production resources: land, hired labour, improved seeds, tractor services, weedicides, fertilizer, pesticides, extension and yield were the independent variables.

Research Questions

Research questions are interrogative statements formulated in specific manners in line with a purpose of a study. They provide a framework for a

study, and help the researcher to be focused during the investigation by delimiting the boundaries of the research and the types of data to be collected.

Amedahe (2002) argues that effective undertaking of a research work involves asking the right questions. Onwuegbuzie and Leech (2006) also reported that, good research questions have four essential characteristics. They are feasible, clear, significant and ethical. An additional characteristics of a good research question is that they often suggest a relationship to be investigated. The research questions for the study were formulated based on the above mentioned characteristics and its relevance for the study. Consequently, the research questions of the study were:

1. What are the socio-demographic characteristics of smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production?
2. What are the levels to access of agricultural production resources by smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production?
3. What are the yield levels of smallholder women farmers in the Offinso North District and Techiman Municipality engaged in maize production?
4. What percentages of maize yield are contributed by smallholder women farmers to their household to meet their household food security needs?
5. What are the household food security status of the smallholder women maize farmers in Offinso North District and Techiman Municipality of Ghana?

6. Does access to agricultural production resources have effect on the household food security levels of smallholder women maize farmers in the Offinso North District and Techiman Municipality?
7. What are the coping strategies adopted by smallholder women farmers in Offinso North District and Techiman Municipality to meet their household food security needs?

Hypotheses

The following hypotheses were formulated and tested:

- H₀: There are no differences in the level of access to agricultural production resources by smallholder women farmers in the Offinso North District and Techiman Municipality engaged in maize production.
- H_a: There are differences in the level of access to agricultural production resources by smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production.
- H₀: There are no differences in the maize yield of smallholder women farmers in Offinso North District and Techiman Municipality.
- H_a: There are differences in the maize yield of smallholder women farmers in Offinso North District and Techiman Municipality.
- H₀: Access to agricultural production resources has no effect on the household food security of smallholder women maize farmers in Offinso North District and Techiman Municipality.
- H_a: Access to agricultural production resources has effect on the household food security of smallholder women maize farmers in Offinso North District and Techiman Municipality

Where: H_0 denotes the null hypothesis and H_a alternate hypothesis.

Significance of the Study

Given women's crucial roles and contributions to household food security, any efforts to reduce food insecurity in Ghana must take into consideration the factors and constraints affecting women producers and removing these production constraints to enhance their production capacities. The study would uncover the level of access to agricultural production resources and constraints faced by smallholder women farmers in the study areas.

The study findings would be a source of vital information for organisations such as the Ministry of Food and Agriculture, NGOs and Farmer Based Organisations working in the Offinso North District and Techiman Municipality of Ghana. The study findings would assist these organizations to address specific production needs of women farmers in the Offinso North District and Techiman Municipality of Ghana to improve their maize yield which would translate into improved household food security.

Policy recommendations from the study would be vital for policy makers working in the area of food security in the study districts and at the national level. Findings from the study would also be relevant in the implementation of the Block Farming the Ministry of Food and Agriculture is implementing and also to inform the planning of the new Ghana Agricultural Sector Investment Programme (GASIP) the Ministry of Food and Agriculture is currently developing.

Most agricultural production in Ghana comes from millions of rural households. This makes it interesting for the study to focus on the household

food security status of smallholder women farmers, as understanding the rural household, which is the source of food surpluses for the urban areas, has important implication for national food security. A threat to household food security ultimately threatens national food security.

The study findings on the household food security status of the women farmers would justify why Government of Ghana and other development partners are undertaking a number of programmes and projects in the study areas and other part of the country to ensure food security. This is because food security is fundamental to the development of any nation as it guarantees one of the essential elements of life. Good quality and nutritious food is critical for a healthy working population that can promote development. It ensures foreign exchange savings through import substitution for commodities in which the country has comparative advantage.

Finally, the study results would contribute to existing knowledge on access to agricultural production resource and household food security studies in the Techiman Municipality, Offinso North District, the whole of Ghana and elsewhere.

Delimitation of the Study

This study could have national policy relevance if it were conducted on a national basis. However, owing to resources (time and money) limitations, the study was delimited to Offinso North District and Techiman Municipality in the Ashanti and Brong Ahafo Regions of Ghana respectively. It is worth mentioning that, most of the women farmers interviewed hardly kept records of their production activities including their maize yields as such, information collected were subject to the respondent's retentive memory and recall error.

In assessing the food security levels of respondents, the food security scale used does not capture all possible dimensions of food security. It does not measure food safety and nutritional status. The U.S. standard food security measure reflects the household's situation over the 12 months before the interview (January-December 2011). This means that, a household that experienced food insecurity at some time during the past year (or other period), and therefore is considered food insecure, may in fact be food secure at the time of the interview.

Organization of the Study

The study is articulated in five chapters. Chapter One sets the background of the study and further provides information on the following: statement of the problem, objectives of the study, variables of the study, research questions, hypotheses, significance of the study and delimitation of the study. The second chapter covers review of related literature to develop a theoretical framework and conceptual framework for the study.

The third chapter is about the methodology of the study, which consist of an introduction, study area, research design, study population, sample, sampling procedure, instrumentation, data collection and data analysis. Analysis and discussion part of the study are found in chapter four. Finally, in chapter Five, summary of the study, conclusions, policy recommendations and suggested areas of research have been presented.

Definition of Key Terms

Terms can be defined in three ways: as a dictionary definition, by giving examples, or by defining in a context the writer wants it to be understood by the audience (Whiteley, 1996). In research work, the word "Term" refers to an

operational definition. As such the following are the operational definitions for some terms used in this research work.

Access: Refers to the right to use something.

Agricultural production resources: In this study the agricultural production resources refers to the following resources required for maize production: land, hired labour, pesticides, fertilizer, improved seeds, weedicide, extension and tractor services.

Landholding: Size in acres of household land under maize cultivation.

Household: A unit comprising of a group of persons living together, sharing from the same dietary pot and same source of livelihood on a regular basis.

Single: Refers to a single woman who is not married, a widow or a divorcee.

Smallholder farmer: Farmers whose agricultural orientation is mainly subsistence and cultivate land not exceeding 4 acres.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter provides information on the importance of maize to the Ghanaian economy, constraints and opportunities for subsistence smallholder farming, role of Farmer Based Organisations in supporting smallholder farmers and brief history of Farmer Based Organizations. It further establishes empirical evidence of women farmers' access to agricultural production resources and its effect on yield. This is followed by theories relating to the following: food availability decline, climate, food entitlement decline, government policy, farm household production, economic theories of farm household production choices, profit maximizing peasant, the utility maximization, and the risk averse peasant farmer.

This is followed by literature on the theoretical perspective of women's empowerment in agricultural production, food security definitions and concepts, global food security, national food security, linkage between food security and livelihood security, food insecurity concept, household definitions and household food security concepts, gender and household food security, linkage between subsistence production and household food security, determinants of household food security, measuring household food security, role of women in ensuring household food security, government policy supporting women farmers in Ghana, challenges to food security in Africa, efforts by government in Africa to ensure national food security, achieving food security in Ghana, and coping strategies adopted by households in

meeting their food security needs. Finally, a conceptual framework of the study is presented and discussed.

Importance of Maize to the Ghanaian Economy

Maize (*Zea mays*) has been cultivated in Ghana for several hundred years. After being introduced in the late 16th century, it established itself as an important food crop in the southern part of the country. Although maize attracted the attention of commercial farmers, yet it never achieved the economic importance of traditional plantation crops, such as oil palm and cocoa. Maize is a major staple crop in Ghana and also an important component of poultry and livestock feed and to a lesser extent, a substitute in the brewing industry. It is grown by the vast majority of rural households in all parts of the country except for the Sudan savannah zone of the far north. In Ghana, maize is cultivated by both men and women. What distinguishes Ghana from many other countries, however, is that in Ghana women frequently manage their own maize fields (Alderman & Higgins, 1992).

Despite its widespread popularity as a staple food, maize is predominant in human diets. In both rural and urban households, maize contributes less than 20% of calories to the diet, falling far behind the contribution of root and tuber crops. Even in some areas in Ghana where maize is a leading staple, it would be highly unusual to find maize contributing more than 35% to household calorie supply. Maize in Ghana is consumed in a variety of forms. In the north, it is commonly eaten as a thick gruel, similar to the way that sorghum and millet are consumed. In the south, it is frequently used to prepare porridges and more solid foods such as “Banku” (Bumb, Teboh, Atta & Asenso-Okyere, 1994).

Constraints and Opportunities for Subsistence Smallholder Farming

While subsistence production have shown to be important for household food security, the productivity of smallholder farmers are quite low and some rely on non-farm employment for income. According to Rockefeller Foundation (2006), this is as a consequence of mostly the non-use of high-yielding crop varieties. If better seeds and technologies could reach the farmers, the inefficiency and food shortage risks could be significantly reduced. However, the challenges of bringing better seeds, fertilisers and technologies to smallholder farmers are much more complex. The complexity arises from the diversity of climate, soils and the range of suitable crops.

Nonetheless, it is possible to deliver these improved inputs and assist farmers to use them more effectively. In addition, there is a need to increase access to assets, as household assets are the major determinants of farmers' ability to participate in agricultural production and to secure livelihoods through subsistence agriculture (Adams & Bumb, 1979).

The lack of assets for agricultural production is predominant in sub-saharan Africa, as evidenced by unsustainable small farm sizes, poor-quality of land, and the fact that investment in irrigation is negligible. In addition, poor health services and education further limits productivity of agriculture and access to other livelihood options (Adams & Bumb, 1979).

In view of the low productivity of agriculture in Africa, long-term food security on the continent can be improved by encouraging farmers to pursue sustainable intensification of production through the use of improved inputs (Clay, 2002).

This will require a dramatic increase in the use of fertilizer and organic inputs. Well-functioning input and output markets need to be established as that will help farmers acquire and use improved inputs and be able to market their produce (Dorward, Chirwa, Boughton, Crawford, Jayne, Slater, Kelly, & Tsoka, 2008).

Role of Farmer Based Organisations in Supporting Smallholder Farmers

Farmer Based Organizations (FBOs) are essential institutions for the empowerment and advancement of farmers and the rural poor. Hence after years of neglect, many African countries including Ghana are pursuing efforts to rapidly modernise their agricultural sector with farmer based organisations being portrayed as key catalysts in the process. Farmers have organised themselves in association, cooperatives, village groups at a local level and from there, they have created unions or federative structures at regional, national, sub national up to international level. This shows that farmers are determined to be in control of their own development. Farmer Based Organisations (FBOs) exist to promote the interest of their members. Increasingly, farmer organisations are expected to play critical roles in driving the development of agriculture. Strong farmer organisations are able to influence policies that impart their membership (Stockbridge, Dorward, Kydd, & Poole, 2003).

According to Stockbridge et al., (2003), the services that farmer organisations offer to their membership include:

1. marketing services (input supply, output marketing, processing, and market information)
2. facilitation of collective production activities
3. financial services (savings, loans and other forms of credit)

4. technology services (education, extension, research)
5. education services (business skills, health, general)
6. welfare advocacy (health, safety nets)
7. policy advocacy
8. managing common property resources (water, pasture, fisheries, forests).

Farmer Based Organisations (FBOs), cooperatives, peasants' associations, agricultural labour unions among others, have programmes of equity and equal opportunity aimed at improving the productivity and status of farmers. It is worth mentioning that special intervention is often required to address these production resources constraints to improve the yield and status of women. Achieving equity requires paying special attention to the conditions of women farmers by identifying their constraints (de Janvry & Sadoulet, 2006).

Brief History of Farmer Based Organizations

Although FBOs are widely perceived as an institutional response to different economic needs and social constraints of farmers, a variety of factors motivate their formation (World Bank., 2007). Private sector organizations, for example, establish FBOs to increase profitability, largely by reducing transaction costs. FBOs enable private entities to deal more effectively and efficiently with smallholder farmers (Stockbridge et al., 2003). Through FBOs, private investors may reduce the cost of dealing with farmers, enhance the volume and quality of farm produce, and improve credit recovery from farmers (Devereux & Maxwell, 2001).

Many buyers of farm products prefer to work with FBOs instead of individual farmers because the groups are better able to provide stable supplies of quality products (Vorley, Fearn, & Ray, 2007). Private buyers' transaction costs may be significantly reduced if they deal with a group of farmers selling an aggregated product of homogeneous quality rather than with many individual farmers selling small quantities of uncertain quality (Shiferaw, Hellin, & Muricho, 2011).

Many governments establish FBOs to improve rural service delivery and access to public services to enhance economic growth and peoples' welfare (FAO, 2009; World Bank, 2007). The establishment of FBOs allows public extension agents to reach out to larger numbers of farmers, especially given the inadequate number of extension agents in many developing countries. In Ghana, for example, each extension worker currently handles 2,500 farmers which is far too many for a single agent to reach effectively. FBOs are therefore seen by governments as an effective mechanism for increasing agricultural productivity in many African countries since providing access to extension information and new agricultural technologies for large numbers of farmers plays an important role in increasing productivity and enhancing food security (MoFA, 2010).

Some governments require farmers to organize themselves into FBOs as a condition to gain access to support such as grants or credit (Shiferaw et al., 2011). In recent times, the desirability of establishing FBOs is finding its way into national development policy documents in some countries (Bernard, Collion, de Janvry, Rondont, & Sadoulet, 2008). In Ghana, for example, recent policy strategy documents such as the Growth and Poverty Reduction Strategy

(GPRS II, 2006-2009), the Ghana Shared Growth and Development Agenda (GSGDA, 2010-2013), and the Food and Agriculture Sector Development Policy (FASDEP II) all place strong emphasis on the establishment and strengthening of FBOs as one key strategy in developing the predominantly smallholder agricultural sector in the country (MoFA, 2010).

Like governments, many nongovernmental organizations (NGOs) encourage the establishment of FBOs to improve rural service delivery, economic growth, and poverty reduction among farmers (Ahearn & Nehring 1998; World Bank 2007). Donors and NGOs often prefer to deal with farmers through farmer organizations, particularly if they feel there is institutional failure in the public or private sectors (Ravallion, 1989). However, it is important to note that, the support of NGOs and donors in the establishment of FBOs is sometimes funneled through government agencies. Timmer (1998) indicated the following as the qualities of an effective FBO:

1. Equity in decision making.
2. Leadership of various positions should be democratically elected.
3. Should be non-political, neither prone to political manipulations.
4. Should organize regular and routine meetings.
5. Should have a policy guideline.

For many donor and NGO, joining an FBO is the only way to participate in and receive support from a project, with no consideration given to farmers who do not belong to such groups.

After independence, the government of Ghana tried to use the co-operative approach to agriculture according to the socialist development model. Cooperative and state farms were created which collapsed in the 1980s for

management and other economic reasons. The reputation of cooperatives has since been tarnished by these disappointing experiences. In the 1980s, the government supported the formation of the Ghana National Association of Farmers and Fisherman (GNAFF). Other Farmers Apex Organisation in Ghana include the Peasant Farmers' Association of Ghana (PFAG), National Farmers and Fishermen Award Winners' Association of Ghana (NFFAWAG), Ghana National Association of Farmers and Fishermen (GNAFF) and Farmers Organisation Network in Ghana (Strebelle & Nyamekye, 2011).

The FASDEP stated that efforts to develop FBOs as part of the strategy for improved access of smallholders to services will continue. The aim of FASDEP II is to encourage the evolution of FBOs at the grass roots, and networking them through hierarchy of local, district and regional groupings to a national apex. It is expected that this will give the FBOs power to bargain (MoFA, 2012). In October 2009, four organisations formed the Ghana Federation of Agricultural Producers (GFAP): Ghana National Association of Farmers and Fishermen and Fishermen (GNAFF), Peasant Farmers Association of Ghana (PFAG), Farmers' Organization Network in Ghana (FONG) and Apex Farmers Organization of Ghana (APFOG). GFAP was launched under the theme of "enhancing agricultural development with a united voice". GFAP is a private Non Governmental Organization and a Farmer Based National Apex Organisation formed to spearhead the course of unifying all Farmer groups in Ghana and to advocate favorable policies for Agricultural Producers in Ghana (Strebelle & Nyamekye, 2011).

Farmers are motivated to form or join farmer groups primarily because this enables them to have easier access to credit (as a result of the concept of

group collateral) and or because most government interventions are usually targeted at farmer groups rather than individual farmers. The majority of farmer organizations in Ghana are characterized by weak organizational capacity, limited leadership and severe resource constraints. Perhaps the most critical functions FBOs play is that they enable greater farmer participation in policy making processes that farmers acting individually often are not able to achieve. Governments since the return to democratic rule in 1992 have recognized at least in principle, the need to ensure the inclusiveness and participation of various interest groups in policy formulation and implementation (Sarpong, 2010).

These organizations also represent the interests of their members in relation to governments, project management, and development of policy. When women farmers' access to membership and leadership positions in these organizations is restricted, by law or custom, their access to resources and their ability to make their views known to policy makers and planners is also restricted. The obvious result is the inability of women farmers to carry out their roles in agriculture and food security to optimum potential. The same agrarian reform programmes that have given land titles to male heads of households and thus restricted women's ownership of land, have also restricted women's membership in FBOs. Even where women do have access to membership in cooperatives and other rural organizations, they make up a small minority of the leadership (FAO, 1993).

Empirical Evidence of Women Farmer's Access to Agricultural Production Resources and its Effect on Yield

A two-year emergency rice (*Oryza sativa* L.) initiative launched in 2009 in response to the global rice crises in 2008 with the objective of improving food security in Ghana was funded by the United States Agency for International Development (USAID) as a component of its Food Security and Crisis Mitigation Program which was implemented in Ghana by the International Center for Soil Fertility and Agricultural Development (IFDC), Catholic Relief Services (CRS), Council for Scientific and Industrial Research-Savanna Agricultural Research Institute (CSIR-SARI) and Ministry of Food and Agriculture (MoFA). The project enhanced access to quality seed and fertilizer for over 12,600 farmers while expanding knowledge of best production technologies. Average yield increased by 92% and also 4,093 women farmers constituting about 32.4% of the total number of participating farmers reported of increased yields (Buah, Bempah, Enimil, Blewu, & Agyei-Martey, 2011).

A study conducted in Kenya to assess gender specific constraints that affects household food security among smallholders women farmers in Western Province of Kenya revealed that, lack of access to land, extension services, credit, income and low education level were the most important constraints facing women farmers. While women accessed credit from informal sources such as rotating credit and savings, men accessed credit from banks and cooperatives. Women who accessed credit spent more on farm inputs and consequently they realized higher maize output (Kandoole & Msukwa, 1992).

The results further showed that, access to extension services was a problem to both men and women. 21% of women and 20% of men had access

to extension services demonstrating the inability of the current extension system to disseminate existing and new technologies to smallholder farmers.

Women were further constrained by limited time to perform their roles as well as limited access to technologies (Kandoole & Msukwa, 1992). In another study in Kenya, it was observed that, if women farmers were given the same levels of education, experience and farm inputs as their male counterparts, their yield of maize, beans and cowpeas could increase by 22% and by 25% if all women attended primary school (Alderman, 2005). Huffman and Evenson (1980) reported that extension services provided to women farmers had immediate effect on their productivity. Jamison and Lau (1982) explored the role of farmer training by extension staff on agricultural productivity. Using a Cobb-Douglas production function, their regression results revealed that extension services enhanced agricultural productivity on Thai, Korean and Malaysian farms.

Solid empirical evidence shows that, if women farmers have access to agricultural production resources, they would achieve higher yields. The yield gap between men and women averages around 20–30 percent, and most research finds that the gap is due to differences in resource use. Bringing yields on the land farmed by women up to the levels achieved by men would increase agricultural output in developing countries between 2.5 and 4 percent. Increasing production by this amount could reduce the number of undernourished people in the world by 12–17 percent. According to FAO's latest estimates, 925 million people are currently undernourished. Closing the gender gap in agricultural yields could bring that number down by as much as 100–150 million people (FAO, 2010).

Research in the Ethiopian highlands found that female headed households produced 35 percent less per hectare, in value terms, than male-headed households but the differences were due to lower levels of input use and less access to extension services by female farmers (Tiruneh, Tesfaye, Mwangi & Verkuijl, 2001). In the same region, yields for barley and other cereals were found to be 50 percent higher for farms operated by men because farms run by female-headed households had only half the male labour and less than one-third of the amount of draught animal power (Holden, Shiferaw & Pender, 2001).

A study of smallholder farmers in western Kenya found that, women's maize yields were 16 percent lower than men's, largely because they used substantially less fertilizer (Ongaro, 1990). A nationally representative study in Malawi also found that, maize yields were 12–19 percent higher on men's plots, but when women were given the same level of fertilizer for use on experimental plots, they achieved the same yields (Gilbert, Sakala & Benson, 2002). In Nigeria, female rice producers achieved 66 percent lower yields than male farmers and the difference was attributed to differences in input use. Similarly, in Ondo and Ogun States also in Nigeria, female small-scale cassava farmers achieved lower yields because they used fewer inputs and purchased inputs of lower quality (Oladeebo & Fajuyigbe, 2007).

Access to resources is essential to improving agricultural productivity of women farmers. As women play crucial roles in agricultural production, improving productivity will depend to a great extent on ensuring that women farmers, as well as men farmers, have sufficient access to production inputs and support services. While both men and women smallholders lack sufficient

access to agricultural resources, women generally have much less access to resources than men. The causes of this are rooted, to a great extent, in: gender-blind development policies and research, discriminatory legislation, traditions and attitudes, and lack of access to decision-making (Bickel, Nord, Price, Hamilton & Cook, 2000).

Worldwide, women have insufficient access to land, membership in rural organizations, credit, agricultural inputs, technology, extension, and marketing services. Some studies have shown that when women farmers have access to resources, they are more productive than men farmers. For instance, it has been reported that in Kenya the average gross value of output per hectare from male-managed plots was usually 8 percent higher than from female-managed plots, but when women used the same resources as men their productivity would increase by 22 percent (Saad, 1999).

Theoretical Framework

Food Availability Decline Theory (FAD)

Food Availability Decline Theory explains that famine or food shortage occurs when there is an aggregate decline in food supply. According to this theory people starve because of a household, national or regional decline in food availability to a level below the minimum necessary for survival. However, the FAD theory has been criticized for dealing with only the supply side which disregards the demand side. It said nothing about people's income and purchasing power. Furthermore, it failed to address the vulnerability differences and access to food from outside the affected area (Sen, 1981).

According to the FAD theory, a decline in food availability may be attributed to many factors. The two most important and frequently used factors

are: Demographic (population growth causing famine) and climatic (drought causing famine). Sen (1981) further argues that starvation is not necessarily linked to a decline in food availability. What is crucial in Sen's view is whether particular individuals or households have access to sufficient food. Starvation is the characteristic of some people not having enough food to eat.

The FAD approach is concerned with climatic conditions in which farmers find themselves, enhancing resource acquisition, improving prices of farm produce and market avenues and facilitating technological advancement in agriculture (Yared, 2001). Sen (1999) indicates that even in the midst of abundance food, people starve because they do not possess the purchasing power. Yared (2001) also indicates that availability of food may still be matched with increasing cases of malnutrition, diseases and unequal access to food. The FAD approach has been criticized for its focus on collective supply rather than the contributions made by the individual smallholder to ensure availability of food. Yared (2001) argues that, this approach does not explain how individuals have access to enough food. In addition, it is misleading to assume that technology always leads to increase in supply of food. The climatic conditions and the general attitude of farmers towards technology and new methods should be considered. Supply of food is also affected by other factors such as the political environment which the FAD approach does not tackle. The gaps left by the FAD approach led to the emergence of the entitlement and interdependence approaches (Workneh, 2006).

There are two competing theories regarding the relationship between population growth and food availability. One argues that, population increases in a geometric progression while food production increases in arithmetic

progression. Therefore, unless population increase is checked, it tends to outstrip food production and famine or starvation will occur. This argument is originally the work of Thomas Malthus who developed the theory of rapid population as a cause of food shortage or famine. Malthus' theory was criticized for his failure to consider the technological improvements in agriculture which would enhance productivity (Devereux, 1993). The second theory on population and food availability argues that, large population size is a positive stimulus for growth. Proponents of this view are Easter Boserup and Karl Marx. For Marx's model, the root causes for hunger are related to production. Boserup considers population growth as a favorable factor for agricultural production. She recognizes population growth as a force favoring technological innovations that expands agricultural production thereby reducing vulnerability to food shortage and hunger (Farinde, Jibowo & Odejide, 1993).

The Food Availability Decline Theory (FAD) is relevant for this study as it provides an idea of how household size (population) can affect household food security. As such in the study, analysis was done to see how household size of the farmers affects their household food security levels. The theory also provides examples of the production risk faced by farmers as indicated in the conceptual framework of this study.

Climate Theory

Many scholars argue that climatic factors such as too much rainfall (flooding) or lack of rainfall (drought) cause crop failure and can lead to food shortage or famine. Climatic variability like drought or flooding have adverse impact and can cause reduced crop yield, livestock losses, and drinking water

shortages. These have social consequences such as forced sale of household assets, ecological degradation, increasing price of food and food become inaccessible to poorest households. Unemployment, migration, diseases outbreak, destitution, hunger or famine may also occur. However, opponents of climatic based explanations argue that, famine could occur without any abnormal weather due to various socio-political and economic processes (Sen, 1981).

This theory explains in detail how climatic variables affects farmers production activities and its effect on household food security. Variables outlined in this theory was included in the conceptual framework of the study under the component “Mitigation of Production Risk”. This is one of the support system that influences farmer’s production activities.

Food Entitlement Decline Theory (FED)

According to the Food Entitlement Decline Theory (FED), food availability at global or national level alone cannot bring food security at the household level. Thus, FED has contributed significantly to the shift of emphasis to household and individual level of analysis. A household may suffer from food shortage in a country where adequate food is available. Thus, food shortage becomes a matter of lack of access that is either inability to produce or being unable to purchase food. Households become food insecure because of failure in entitlement (Devereux, 1993).

According to the entitlement approach, a growth in domestic production does not necessarily prevent famine or hunger as far as what is produced is not equally distributed and the entitlement system that determines access to food is not changed (Devereux, 1993).

Sen (1981) argues that, one is entitled to food through four possible sources of entitlement. It could be through trade, through production, through the application of ones labour or through gift and transfer. The ability of a person to command food is therefore determined by what he owns (endowment) and the bundles of alternatives that can be obtained through exchange entitlement.

The strong points of FED approach is its potential capacity to identify which groups of people will be more vulnerable by various threats of availability or access to food. However, the FED model also has certain weaknesses and is subject to criticism. The main limitations are its failure to consider intra-household distribution of food, exclusion of entitlement through food aid and non-legal transfer of resources (Maxwell & Smith, 1992).

The entitlement approach takes into consideration, food production, ownership of resources, the prevailing socio-economic and political conditions in the society (Yared, 2001). According to Sen (1994) who is known to be the harbinger of the entitlement approach, institutions such as trade unions, political parties, NGOs and the media also have influence on policies which affect food security.

Devereux (1993) summarizes the entitlement approach under the endowment set as follows: To produce food, a person needs a set of resources otherwise known as endowments. These resources are assets such as land, labour, capital, knowledge gained from education and the person's own skills. The person's membership in a community also means other endowments such as culture, practices and the state laws. The entitlement set refers to the products obtained from engaging the resources into production. The

entitlement set usually depends on the combination of resources or the endowment set that a person chooses. Simply put, the endowment set refers to the inputs whereas the entitlement set denotes the outputs.

The connection between the inputs and outputs is known as the entitlement mapping. Example is given as the relationship between the amount of resources employed on a farm and the output realized from cultivation. It can be noted that changes in one can affect the other. Yared (2001) identifies a person's endowment as the resources which are converted to produce food or which can be exchanged for food. To transform these endowments into production requires knowledge, technology, skills and experience (Sen, 1981).

The ongoing discussion as summarized by Sen (1981) is that to satisfy one's entitlement to food, the endowments which are mainly land, labour and capital should be put into production. One's income in an employment can also give him or her access to food. This has been described as interdependence because people who are not directly into food production but in other sectors such as industry and services also have access to enough food because they are able to use their incomes to command for food.

The idea of interdependence introduces the concept of exchange conditions which are the presence of effective supply and demand marked by certain prices (Sen, 1994). Yared (2001) also views the food security problem through the interplay of demand and supply. This means that the two conditions must be effective. Once food is supplied, it should be demanded to boost production. Though having the purchasing power is crucial, it can be said that it is not an end on its own. Yared (2001) notes that food insecurity may also occur when there is ill health, loss of land and labour, fall in incomes, food

price hikes and loss of employment. Also, unforeseen contingencies such as flood, bush fires and drought may cause food prices to increase leading to food insecurity.

The Food Entitlement Decline Theory provides a good guidance on the coping strategies smallholder farmers adopt in meeting their household food security. As such the study investigated the coping strategies adopted by the respondents. The theory further enumerated entitlements or production resources required by farmers for their production activities and provides a clue to how these resources behave and affect crop yield and household food security. The theory further provides examples of production risk farmers face which were included in the conceptual framework of the study.

Government Policy Theory

Whenever food shortage or famine occurs in a given country, the government is responsible for preventing the crises. Some researchers claim that, government policy failures or inappropriate development strategies are responsible for the recurrence of food shortage and famine (Nicola, 2003 & Fassil, 2005).

According to this theory, Government policy provides the enabling environment, specific programmes and projects that ensures that farmers have access to agricultural production resources which finally translates into improved household food security. As such in the conceptual framework of the study government policy is one of the support systems that must work in harmony with the other components to ensure farmers access to production resources for increased crop yield. In the study, government policy was not investigated (Nicola, 2003 & Fassil, 2005).

Farm Household Production Theory

Peasant farm households account for probably not less than a quarter of the world population and most of them live in developing countries where they sometimes represent seventy percent of the national population. Agricultural production is often importantly dependent on their performance as farmers, and world poverty is disproportionately found among farmers, making the understanding of determinants of their mode of production a prime concern in any strategy of poverty alleviation (Bardhan & Udry, 1999).

Ellis (1992b) defined the term 'peasant' as follows: Peasants are farm households, with access to a piece of land and utilizing mainly household labour in farm production. There is always interchangeable use of the term 'smallholder' with 'small scale', 'resource poor' and 'peasant farmer'. Smallholder farmers are farm households with access to means of livelihoods in land relying primarily on family labour for farm production to produce for self-subsistence and often for market sale. Peasant farms are production as well as consumption units. They consume part of their produce and sell part of it to meet their cash requirements. Seeking to protect household members against the hunger and impoverishment is of great importance to any rural farm family in a less developed country (Dasgupta, 1993).

The farm household behaviour is influenced by several natural market and social uncertainties in developing countries. This has raised some complexities in terms of understanding their production decisions. They have a multi-activity character thus, they engage in market and non-market tasks such as agriculture, pastoralism, fishing, crafts, gathering fruits, nuts, fuel wood and water (Hussein, 2004).

In the study, percentage contribution of farmers' maize yield to their household was analyzed based on this theory which informed the study that, smallholder farmers produce and consume part of their produce.

Economic Theories of Farm Household Production Choices

The alternative economic theories of peasant/smallholder farmers household behaviour are presented below. Each theoretical approach assumes that, peasant household has an objective function to maximize, with a set of constraints. Moreover, theories are based on a set of assumptions about the working of the larger economy within which peasant production takes place. Not all assumptions are shared by all theories, but all of them share the same theoretical method in explaining farm household behaviour.

The first is the model of 'profit maximizing' peasant theory. It assumes that peasants have the objective of maximizing profit. Since the process of decision making of peasant family involves both production and consumption aspects, other economists have argued that profit maximizing theory tend to ignore a major side (i.e. consumption side) of the peasant household decision process. Thus, the neoclassical 'agricultural household models' became popular because it incorporated both consumption and production goals of farm households.

Mostly in reaction to former models other economists have crafted the 'risk aversion' peasant theory, which states that, the objective function of peasant households is to endure the survival of the household by avoiding risk (Bardhan & Udry, 1999).

Profit Maximizing Peasant Theories

Schultz's hypothesized that, farm households in developing countries are 'poor but efficient' (Schultz, 1964). Schultz described peasant production mode as a profit-maximization behaviour, where efficiency is defined in the context of perfect competition. Several studies subsequently used the allocative efficiency criterion to test whether peasants were efficient or not (Bliss & Stern, 1982).

Profit maximization has both behavioural content (motivation of the household) and a technical-economic content performance. The economic theories of farm household behaviour, though, evolved along the line of other important criticisms to the profit maximizing theory. That is the existence of trade-offs between profit maximization and other household goals and the role of uncertainty and risk in farm household production decisions (Bardhan & Udry, 1999).

The "profit-maximizing peasant theory" has been criticized on the ground that it overlooks the aspect of farm households' self-consumption needs in the decision processes. The neoclassical agricultural household models, which include both the production and the consumption goals of farm households, became more popular (Bardhan & Udry, 1999).

The Utility Maximization Theories

There are a number of utility maximization theories that have been applied to peasant production behaviour. The main difference with respect to the theory examined above is that, the utility maximization approach takes account of the dual character of the peasant household as a family enterprise and also the consumption side of peasant decision making. The seminal work of Chayanov in the 1920s emphasized the influence of family size and structure

on peasant economic behaviour, through the subjective evaluation of labour within the household, in a context of missing labour market (Becker, 1965).

Expanding the scope of Chayanovian model and assuming perfect markets, neoclassical farm household model has become popular in the 1960s in explaining farm household behavior of handling simultaneous consumption and production decisions. This model typically incorporates the notion of full household income and conceives the household as a production unit, which converts purchased goods and services as well as its own resources into values or utilities when consumed (Becker, 1965).

Thus, households maximizes utility through consumption of all commodities subject to a full income constraint. The model shows that, if all markets exist and all goods are tradables, all prices are exogenous and production decisions are taken independently of consumption decision. In such a condition the decision making process could be regarded as 'recursive' (or separable), because time spent on leisure and used in production become independent; family labour utilization will be directly linked to the market determined wage rate and income is singled out as the only link between production and consumption (Taylor & Adelman, 2003).

In the absence of the labour market, the family decides on the percentage of its total available time to be devoted to production. Hence the separability condition between consumption and production does not exist. The decision process becomes circular as consumption affects income and income affects consumption. Therefore, the validity of recursive modelling of household resource allocation depends on the fact that the household is a price taker and there are no missing or imperfect markets (Bardhan & Udry, 1999).

Indeed, in real life, households living and operating in developing countries are likely to face more than one market imperfection that prevents first-best transactions and investments to take place. Evidence shows that where analysts have tested for recursively in farm household decision-making, most results have been negative (Bardhan & Udry, 1999).

Hence, theoretical advances on farm household models with missing markets opened a new research agenda to neoclassical economists. The household's objective is still to maximise utility from a list of consumption goods (including home-produced goods, purchased goods and leisure), but subject to what may be a large set of constraints, is where a missing market is another 'constraint' imposed on the household. At the same time, the task of empirical economics shifted to provide evidence for market inefficiencies and the impact of these on household production choices (Bardhan & Udry, 1999).

Yet, these theories have serious shortcomings in explaining peasant economies. Like the profit maximising theory, they ignore the uncertainty and risk involved in peasant production and the social context in which peasant production takes place. This does not influence farm household behaviour. Most of the models are static and are assumed that prospects are certain or, equivalently, households are risk neutral. Criticisms to this theoretical framework become particularly sharp when considerations of uncertainty and risk aversion start playing central roles in understanding farm household production decisions (Taylor & Adelman, 2003).

This theory shows relevance to the study as it further justifies why the study conceptual framework should have a component on "use of farmer produce for food" and "sale of farmer produce for food". This is because

smallholder farmers are production and consumption units. It also justifies the need for the component “Mitigation of production risk” as it provides examples of the risk faced by farmers in their production activities as indicated in the conceptual framework of the study although that was not analyzed.

The Risk Averse Peasant Farmer

Peasants produce under a very high level of uncertainty because of natural hazards (weather, pests, disease and other natural disasters), market fluctuations and social uncertainty (insecurity associated with control over resources, such as land tenure, state interventions and war) (Ellis, 1992b). These pose risk to peasant production and make farmers very cautious in their decision-making (Walker & Jodha, 1986).

It is not surprising, therefore, that farmers are generally assumed to exhibit risk aversion in their decision making. Lipton’s (1968) criticism to the profit approach sought to show how the existence of uncertainty and risk eroded the theoretical basis of the profit maximising model. He argued that, smallholder farmers are of necessity risk averse, because they have to ensure that, their household food needs comes from their current production or face starvation. There is no room for aiming at higher income levels by taking decisions with a higher risk (Lipton, 1968).

There are two ways of conceptualising farm household risk-aversion: the ‘standard expected utility theory’ and the ‘disaster avoidance approach’. According to the former approach, farm household makes choices among the available risky alternatives. Such a normative approach is based on a set of assumptions and on an implicit hypothesis that, farm decision-makers are in fact utility maximisers. Other things being equal, a risk-averse household

prefers a smooth consumption stream to a fluctuating one, which-in-contexts of incomplete capital markets or underdeveloped institutional arrangements entails a low risky portfolio-choice of productive activities (Lipton, 1968).

On the other hand, the complexity of risks faced by peasant farmers has led some analysts to develop models of allocative choice that do not depend on the ability to calculate expected returns to large numbers of alternative prospects and the knowledge of complex probability distributions of outcomes. Early criticisms to the expected utility theory assert that, the main limitations of the latter have to do with the measurement of risk aversion and the absence of decision costs. Moreover, expected utility maximisation can be described as a “full optimality model” since they prescribe the best of what an individual can do, given the relevant constraints. But, it fails to specify the decision-process that makes the outcomes possible, and thus it ignores any important role of decision-costs in analyzing decision-making behaviour under uncertainty (Lipton, 1968).

Critics of the full optimality approach in peasant production modelling have formulated an alternative idea of household production behaviour at low level of income in uncertain environment. They assume that, when choosing among risky income streams, household first choose safety and from among safe alternatives they choose in accordance with the expected utility. These models based on a feasible decision process are known as safety first models of choice under uncertainty. Here, the decision-maker is assumed to ensure survival for itself and therefore it wants to avoid the risk of his income or return falling below certain minimum subsistence level (Dasgupta, 1993).

This safety-first criterion can lead to the household favouring either risky income streams or low-risk alternatives. This is to say that, there are no reasons to expect that individuals behave in conformity to the expected-utility theory at very low levels of income that is in stressful circumstances. Disaster-avoidance perspective is helpful in describing individual choice under such conditions (Dasgupta, 1993).

Thus, the attraction of the safety-first approach is that, it is a positive method to capture some specific behaviours that can be culled from the expected utility theory near threshold income levels. Indeed, the safety-first model does not take actual decision-rules as given, as in a ‘pure behavioural and experimental approach’, but it results from the attempt to incorporate the “strong points” from both the behavioural and full optimality approaches into a model which seem appropriate. From a wider view, though, while utility maximization theory cannot highlight problems such as extreme poverty, insecurity and deprivation, which characterize peasant life, the safety first theory explicitly captures these aspects in explaining peasant behaviour in rural economies (Dasgupta, 1993). This Theory is relevant for the study as it buttresses the ideas presented by the Utility Maximization Theories mentioned earlier. The focus is on the types of risk faced by farmers in their production activities.

Theoretical Perspective of Women’s Empowerment in Agricultural Production

Different writers have described women’s empowerment in various ways but all point towards one direction which is the assumption of power or ability by women to address their needs. For instance, Longwe and Clark (1994) perceives it as a means to overcome barriers to women’s equality with men

especially in patriarchal societies. According to Mayoux (2000), women assume the ability to identify their aspirations and strategies for change. Gaining skills and resources to achieve these aspirations constitute their empowerment. In addition, women's empowerment is viewed as a process that increases women's choices or ability to make choices about their lives and the environment they live in (Allendorf, 2007, Mehira, 1997, & Kabeer, 1999).

Aspirations or needs that women strive to achieve have been classified into two categories by Moser who developed a framework for analyzing these needs. The categories are practical and strategic gender needs which arise from inequalities that exist between men and women. Societies prescribe gender roles based on sex hence the condition of the people arising from the gender division of labour resulting into practical gender needs (Taylor, 1999).

According to March, Smyth, and Mukhopadhyay (1999), Moser argued that women and men differ in terms of their needs as two different gender groups due to the subordinate position of women. The subordinate position of women limits their ability to effectively indulge in socioeconomic activities. These limitations are what Moser terms strategic gender needs. Importantly, as Percy (1999) argued, differences also exist within women themselves since they are not a heterogeneous social group. These differences need to be taken into account when identifying or analyzing gender needs in designing women's empowerment programmes (Mosedale, 2005).

The need to address both practical and strategic gender needs have been recognised but the challenge still remains to translate paperwork into practice in terms of integrating women's issues into the mainstream of agricultural development (Razavi & Miller, 1995).

Longwe's Women's Empowerment Framework illustrates Moser's perspective of gender needs. For instance, the framework recognizes that women's strategic gender need entails assuming control over decision making on certain productive resources. Attainment of strategic gender needs is the highest level of empowerment in the framework (March et al., 1999).

As mentioned earlier, women need to address their practical and strategic gender needs. The strategies that are employed demand resources hence access to and control over such resources is very vital if these needs are to be met. Therefore, productive resources that foster agricultural production need to be available to women in terms of accessibility and control to address their needs. However, it should be noted that, access to resources does not imply control over them since the one in control might dominate in the decision making (Kabira, 1997). In line with women's empowerment in agriculture is the control over decision making on land use which according to Allendorf (2007) is the main source of livelihoods as well as power and status.

Mutangadura (2004), emphasized the importance of land to women's economic empowerment. This is the case especially in countries that depend on agriculture for their livelihood and sub Saharan African countries are not exceptional. Access to and control over land continues to be a major setback for women farmers which limit their ability to effectively practice sustainable agricultural development.

Women might sometimes lose access to the land provided to them for food production (Lastarria-Cornhiel, 2006). Men tend to dominate in making decisions about what to grow since societies are constructed in such a way that they control economic activities in the household (Squire, 2003). Kabeer

(2003) attributed the differences in distribution of resources and responsibilities between men and women to society norms which guide the process. In most cases women might acquire some rights over land but the major challenge is ownership of the land.

However in terms of land ownership, Walker and Jodha (1986) reported that, only a small elite and professional or women with high economic status have secured rights through ownership of land and are able to influence decisions. He further stressed that, women's education level and income may all be used as measures of bargaining power. Therefore investing in education for women would change the nature and forces that marginalise women in terms of control over productive resources and services. In sub Saharan Africa, as reported by Gray and Kevane (1999), women acquire rights to land through their membership in households especially through marriage as kins.

This generally means that, these rights might be revoked in cases of divorce or sometimes widowhood as some relatives resort to grabbing land since the women do not own the land (Gray & Kevane, 1999).

Ideally in patrilineal societies where women live in their husbands' home, they are supposed to continue enjoying their rights to land. Land utilization is another essential aspect of agriculture development besides having land rights or ownership. Gender inequalities influence the differences that exist between men and women in accessing inputs for land use despite being a challenge to both. According to Moser's Framework, addressing the input challenges of women entails meeting their practical needs since it does not challenge their subordinate nature (March et al., 1999).

An opportunity to improve women's access to inputs is through provision of credit to women. However, control over credit is not a guarantee for increased incomes as other factors might also play a role. Effective land utilisation requires proper knowledge and skills amongst women farmers. Women should be empowered in a dynamic process that involves developing their capacity to be able to participate in the economic and non-economic livelihoods (Mayoux, 2000).

Despite women contribute more than 50% of the agriculture labour force, yet access to extension services has been difficult. Several factors limit their participation in extension activities where they can gain knowledge and skills in improving agricultural productivity (World Bank, 2009). Another challenge with provision of extension services to women farmers is scheduling of these activities which does not take into account their reproductive roles and eventually affecting their participation (Kabira, 1997). In line with Moser's framework on gender needs, timing of extension meetings is a practical gender need as it helps women to fulfil their society prescribed obligations (Taylor, 1999). Therefore, indirectly men are targeted on the assumption that, they will share the knowledge with their wives. However, some literate men might deliberately conceal information to block benefits hence it is not obvious that the illiterate women will access the information.

This theory provides direction on how women access to agricultural production resources is key to achieving higher yield. It goes on to give examples and justifies why variables such as land, educational level should be included in the study. It also mentions sources of land for women for their farming activities and how it influences control. As such in this study the

researcher investigated the sources of land used by the respondents for their maize production. This theory also explained the importance of education in empowering women. As such the study investigated the educational level of respondents by their household food security status.

Food Security Definitions and Concepts

Food Security Definitions

The term food security originated in international development literature in the 1960s and 1970s. At that time the conventional wisdom was that food insecurity was conceived primarily as a supply issue at an aggregate level because of the significant shortfalls in food supply and high food prices in the world market in the early 1970s. However, despite the favorable supply conditions and low food prices after mid 1970s, the incidence of food insecurity remained high in many developing countries (Shipton, 1990).

The dynamic nature of food security makes it to have different definitions that evolved over time (Hoddinott, 1999). The comparison of these definitions shows the considerable rethinking and reconstruction of officials thinking on food security over the past years (FAO, 2003a). Food security as a concept emerged in the mid 1970s, in the discussions of global food crisis (Maxwell & Wiebe, 1999). The initial focus of food security was the one given by the UN in 1974, which focused on food supply and price stability of basic consumable foodstuffs (FAO, 2003b).

This definition stated food security as “availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”. This definition only indicates availability of sufficient food at a global level, yet it

does not guarantee that every one has access to enough food at an individual or household level (Clay, 2002).

In the early 1980s, however, a paradigm shift occurred in the field of food security following Sen's (1981) claims that food insecurity is more of a demand concern, affecting the poor access to food, than a supply concern, affecting availability of food at the national level. Since then, accepted wisdom has defined food insecurity as being primarily a problem of access to food. At the same time, the unit of analysis shifted from the global and national level to the household and individual level. Over time, a large number of different definitions have been proposed. As a result, in 1983, FAO took up the center stage into further re-shaping the definition of food security to accommodate a new insight into securing access to vulnerable people to available supply of food. In other words, it was defined to maintain the balance between demand and supply sides of the food security equation. It was stated as "ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 2003b).

This definition comprises of four key dimensions of food supplies: availability, stability, access, and utilization. The first dimension relates to the availability of sufficient food, i.e., to the overall ability of the agricultural system to meet food demand. Its sub dimensions include the agro-climatic fundamentals of crop and pasture production and the entire range of socio-economic and cultural factors that determine where and how farmers perform in response to markets (FAO, 2003b).

The second dimension, stability, relates to individuals who are at high risk of temporarily or permanently losing their access to the resources needed

to consume adequate food, either because these individuals cannot ensure *ex ante* against income shocks or they lack enough “reserves” to smooth consumption *ex post* or both. An important cause of unstable access is climate variability, e.g., landless agricultural laborers, who almost wholly depend on agricultural wages in a region of erratic rainfall and have few savings, would be at high risk of losing their access to food (FAO, 2003b).

However, there can be individuals with unstable access to food even in agricultural communities where there is no climate variability, e.g., landless agricultural laborers who fall sick and cannot earn their daily wages would lack stable access to food if, for example, they cannot take out insurance against illness (FAO, 2003b).

The third dimension, access, covers access by individuals to adequate resources (entitlements) to acquire appropriate foods for a nutritious diet. Entitlements are defined as the set of all those commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community of which he or she is a member. Thus a key element is the purchasing power of consumers and the evolution of real incomes and food prices. However, these resources need not be exclusively monetary but may also include traditional rights (FAO, 2003b).

Finally, utilization encompasses all food safety and quality aspects of nutrition, its sub dimensions are therefore related to health, including the sanitary conditions across the entire food chain. It is not enough that someone is getting what appears to be an adequate quantity of food if that person is unable to make use of the food because he or she is always falling sick (FAO, 2003b).

However, this definition does not tell us whether what individuals consumed is enough or not. Apart from this, it fails to show to what extent the consumed food has nutritional value for active work. Realizing the aforementioned gap, in 1986 the most influential definition of food security concept was introduced by the World Bank which broadened the emphasis from food availability to include access to food and narrowed the focus from the global and national to households and individuals, thus access by all people at all times to enough food for an active, healthy life (World Bank, 2009).

This definition happens to encompass broader sense of food security and the clear distinction between chronic food insecurity and transitory food insecurity, which are caused by the natural disaster, economic crisis and conflict (Maxwell & Wiebe, 1999).

Koester (1986) defines food security as the ability of food deficit countries, regions, or households to meet target consumption levels on a year-to-year basis. Food security has two facets, first, real income may be too low to provide target consumption for all groups of the society even in years of normal or above-normal domestic production, and second, real income may fluctuate as a result of variations in domestic production of food and non-food products or of import and export prices (Koester, 1986).

There are four core concepts, implicit in the notion of “secure access to enough food at all times”. These are: (a) access to enough food, defined by entitlement to produce, purchase or exchange food or receive it as a gift. Lack of physical, human or social resources causes people’s access to fall below their subsistent need; (b) sufficiency of food, defined mainly as the calories needed for an active and healthy life; (c) security defined by the balance

between vulnerability, risk and insurance and (d) time, where food insecurity can be chronic, transitory or cyclical (Debebe, 1995).

In the mid 1990s the new definition of food security, which ranges from individual to global level was inculcated. It incorporate food safety and nutritionally balanced diet, which reflects the composition of food. It also shows that, food preference of a society needs to be considered as the component of human right. Making the definition very complex (FAO, 2003b).

This definition was given by FAO in 1996, as "food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). USDA (1995) also defined food security as, "when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life". This definition encompasses availability, access and utilization.

As reported by Sen (1981), food security focuses on food availability in a macro sense. The goal is to ensure that sufficient quantities of appropriate kinds of food are available from domestic sources, imports, or donor sources (Webb, Coates, Frongillo, Rogers, Swindale, & Bilinsky, 2006).

Food availability refers to the physical availability of food which is a function of both home production and imports (Renzaho & Mellor, 2009). From a food availability perspective, increased food security occurs when the producer price of food rises, conventional factor input prices fall, improved agriculture technology prices fall, user costs of infrastructural services fall, weather conditions improves in food producing areas, the world market price

of food falls, national domestic income rises, international interest rates fall, the volume of food aids increases, and the domestic interest rates fall (Fosu & Nico, 2011).

The focus of both domestic and international policy was on removing constraints to food availability by concentrating on agricultural policy, trade policy, marketing and transportation systems, the role of natural disasters, and the price effects of economic policies. Eventually, the realization grew that availability was necessary, but not sufficient to promote food security (Webb et al., 2006).

Food availability is achieved when sufficient quantities of food are available to all individuals. Such food can be supplied through household production, other domestic output and commercial imports or food assistance. The concept of food security was expanded to include access. The debate on food security shifted from macro supply issues to focus on the ability of households to obtain food in the market place or from other sources. Having access to food includes having physical access to a place where food is available. It is important to note that, in many developing countries, the availability and access dimensions of food security are strongly linked (Webb et al., 2006).

According to Webb et al., (2006) access refers to individuals having adequate resources (entitlements) to acquire appropriate foods for nutritious diet. Food access is largely determined by the ability of households and individuals to obtain food from their own production, purchases and other sources, such as gifts, government transfer and food aid. Food utilization or

consumption which is the third aspect of food security speaks to the proper usage of food and includes processing, storage, consumption, and digestion.

How the food is prepared (which affects nutritional value) and the health of the individuals consuming the food which affects the ability to absorb and use nutrients may affect food security. Providing nutrition education and family management skills is thus another aspect of the process of ensuring food security (Webb et al., 2006).

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”. The key elements of the definition, as is the case with other definitions, are nutritive quality of food, self-sufficiency, physical and financial availability (MoFA, 2002).

Global Food Security

The first phase of food insecurity to be experienced as a crisis began with the world food crisis from 1972 to 1974 which lasted until about 1980. However, the most notable and unusual feature was a doubling of international grain prices, caused largely by harvest failure in the Soviet Union and grain imports by that country. This crisis was an issue of global food security that could not be tackled by existing institutional arrangements alone. In 1974, the World Food Conference recognized the food crisis as a global problem (Clay, 2002).

The FAO also set up a committee on World Food Security. In subsequent years, the Food Aid Convention was strengthened. All these measures served to set in place an international regime in which the supply of

food, and the ability of countries to acquire it, became essential features. It is ironic that, this period of thinking and action on food security at a global level coincided with a time in which poverty alleviation and food distribution began to be given greater attention in international discourse on development. This period was the era of integrated rural development, basic needs projects, and employment missions. There was something of a mismatch between food security and wider development thinking (Devereux & Maxwell, 2001).

Global food security depends not only on raising global production, but also on reducing distortions in the structure of the world food market and on shifting the focus of food production to food-deficit countries, regions, and households. Many of the countries not growing enough food to feed their populations possess the largest remaining reservoirs of untapped agricultural resources. Latin America and sub-Saharan Africa have vast tracts of unused land. Although the quality and quantity of land may vary greatly from nation to nation, yet much of it is ecologically vulnerable. The Soviet Union and parts of North America have significant amounts of frontier land suitable for agriculture. Only Asia and Europe are truly land-starved because of population pressure (FAO, 2004).

Global hunger caused 25,000 deaths per day and deprives over 854 million people from living healthy, productive lives. Without food, men and women cannot work and children cannot learn, making long-term economic stability and growth in many countries nearly impossible. A majority of the world's poorest and most vulnerable people live in rural towns and are dependent on agriculture for food, employment and income. There is no quick fix to the food security crisis that continues to afflict the world's poorest

nations. However, in the medium term, action can be taken to lay the necessary foundations for a lasting solution to the crisis, enhancing the sustainability of food production and agriculture while simultaneously improving the quality and safety of the food available for consumption, particularly in the least developed countries (FAO, 2001).

Food security also depends on ensuring that all people, even the poorest of the poor, can get food. While on the world scale this challenge requires a reappraisal of global food distribution. Inequitable distribution of the means of production, unemployment and underemployment are at the heart of the problem of hunger in many countries. Global food security requires that a sufficient quantity of food be present to feed the world population (FAO, 2001).

National Food Security

National food security is defined within the context of national food self-reliance. It implies adequate access by all people at national and household levels to domestically produced food at all times. It involves regular and sustainable access without dependence on imports or food aid which is detrimental to local production in Africa (Wunderlich & Norwood, 2006).

Equating national food security with household food self-sufficiency is a problem that needs to be clearly understood. This indicates that, attaining a macro-level food sufficiency does not ensure the achievement of household level food security. It is necessary but not sufficient to solve household level malnutrition and food insecurity problems (Wunderlich & Norwood, 2006).

Clay (2002) also defines national food security as the availability of sufficient food stocks in a country that can be replenished from harvests or

imports. Rutsch (2003) interprets national food security as the ability of a country to meet all its staple food requirements through domestic production.

A nation is food secure when their food system operates in such a way that, there will be enough to eat. Food security will be achieved when the poor and the vulnerable, particularly women and children and those living in marginal areas in a country, have secure access to food. Food security at the national level can be achieved when the poor and vulnerable have sustainable livelihoods. Food security however requires the efficient and equitable operation of the food system (Clay & Schwarzweller, 1991).

Many developing countries fail to meet this fundamental requirement for food security because they lack the resources, such as sufficient arable land, and infrastructure necessary to secure a sufficient food supply. If food availability is secure, the next requirement of food security is food access, which refers to the ability to obtain safe, nutritious food. In some developing countries, food is technically “available,” but people are unable to physically obtain it due to transportation or financial impediments. Sometimes the food that is available is unhealthy, unsafe, or culturally inappropriate, therefore cannot be consumed (Clay, 2002).

Linkage between Food Security and Livelihood Security

An issue that is linked to the issue of food security is livelihood security. It puts food security in a broader perspective. In general, security means stability and continuity, and livelihood security means security in the provision of basic human needs such as food, clothing, shelter, education and health. Thus, household food security can be seen as an integral part of livelihood security (Ellis, 2000).

According to Frankenberger and McCaston (2001), the concept of livelihood security developed through the evolution of concepts and issues related to food and nutrition security. When a household's livelihood is secure, it should be food-secure as well. But a food-secure household might not be secure in terms of livelihood. The word "livelihood" originates from the word "live". The simple dictionary definition of livelihood is a "means of living". Longman's contemporary English dictionary puts this a bit more elaborately as "the way by which one earns enough to pay for what is necessary". The concept of livelihood is relatively new but is now widely used in poverty and rural development literature. Its meaning can often appear elusive, either due to vagueness or to different definitions being encountered in different sources (Ellis, 2000).

According to Chambers and Conway (1992) livelihoods "comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living". To Ellis (2000), livelihood "comprises the assets (natural, physical, human, financial and social capital), the activities, and the access. These mediated by institutions and social relation together determine the livelihood gained by the individual or household". Chambers (1989) defines livelihood as "adequate stocks and flow of food and cash to meet basic needs".

Redclift (1990) states that security is "ownership of", or "access to", resources and income earning activities, including reserves and assets to offset risks, ease shocks and meet contingencies". He defines sustainable as being "the maintenance or enhancement of resource on a long-term basis".

According to Dietz (2000), a sustainable livelihood perspective can easily combine the improvement of a variety of options because it does not focus solely on land. Campilan (1998) cites the definition of the World Commission on Environment and Development (WCED) for livelihood as: “adequate reserves and supplies of food and cash to meet basic needs”. He further states that “sustainable livelihoods can be assured through sustainable employment and adequate remuneration; engagement in productive activities which are ecologically sustainable and economically sound; and ownership of or access to resources and their management, within their capacity to recover”.

Huq (2000) argues that livelihoods encompass income, both cash and kind, as well as social institutions relating to kinship, family, neighborhood and village, women’s groups and property rights required to support and to sustain a given standard of living. Livelihoods involve social and kinship networks for facilitating and sustaining diverse income possibilities.

According to Niehof and Price (2001), definitions such as those of Chambers and WCED do not distinguish between the dimensions of process, activities, outcomes, assets and resources. They suggest that livelihood generation will display the workings of a multifaceted and dynamic system, which they call the livelihood system. They define livelihood in terms of a system having the following components:

Inputs: resources and assets.

Output: livelihood.

Purpose: livelihood adequacy for meeting basic needs

Activities: livelihood generation and the composition of the
livelihood portfolio.

Agency: efforts of households and individuals to achieve livelihood adequacy.

Quality: degree of vulnerability (or sustainability) of the livelihood produced.

Environment: context within which the livelihood system functions interfaces with other systems and solutions.

Locus: the household as the locus of the livelihood generation.

The concept of livelihood as described by Long (1997) expresses the idea of individuals and groups striving to make a living, attempting to meet their various consumption and economic necessities, coping with uncertainties, responding to new opportunities, and choosing between different value positions.

To assess livelihood sustainability we have to look at how rural people are maintaining their livelihoods and understanding the dynamics of rural livelihood systems and people's strategies. Households manage their livelihood strategies according to the household situations, using different types of strategies in different situations and at different phases in the life course of the household. Furthermore, people develop their livelihood strategies according to the situation they face on the basis of their past experiences (Pennartz & Neihof, 1999).

Households use their assets, livestock or savings, or social capital to handle or overcome situations of stress. Rural people maintain their livelihood through a bundle of activities that can be regarded as a livelihood portfolio (Niehof & Price, 2001). These livelihood portfolios are maintained in organized ways by using assets and resources with certain skills (i.e. inputs) to

generate livelihood security, referred to as livelihood strategies. Livelihood strategies would include utilizing all the resources or assets they have access to, such as natural resources (land, water, biological), physical resources (buildings, irrigation canals, roads, tools, and machines and so on), financial resources (savings, access to credit), human resources (labor through education, experience, skills and health) and social capital (Ellis, 2000).

The availability of resources and skills to utilize these properly is crucial in determining the dynamics of household level livelihood security. Recent debates have identified crucial issues for attaining livelihood security or a sustainable livelihood as centering on resource access, livelihood portfolio (Hamelin, Habicht & Beaudry. 1999), livelihood diversity (Ellis, 2000), asset vulnerability (Moser, 1998), and entitlements (Sen, 1981). Overall, livelihood security includes secure access to land, resources and markets (Boyd & Slaymaker, 2000). Frankenberger and McCaston (2001) suggest that livelihood can be secured through livelihood promotion, protection and provisioning strategies.

Women and men engage in different activities to obtain income. Studies have shown that women focus on the production of food crops, and that women's income from cash cropping and other sources is more likely to be spent on food than the men's income. It has been argued that households with female heads are more likely to be food insecure than those with male heads (Boyd & Turner, 2000).

In a study conducted in Kwazulu-Natal to assess the impact of land reform programme in South Africa, it was realized that it failed to integrate food security concerns and the needs of rural women. The study suggested that

there are important differences within and between households headed by women with respect to food security status and strategies to attain food security. The study further stated that, issues of poor governance, economic mismanagement, contributed to food insecurity in a country (Ashley & Carney, 1999).

Food Insecurity Concepts

Food insecurity is also often used interchangeably with similar concepts such as poverty, malnutrition, and hunger, which can be seen as extreme forms of food insecurity. Food insecurity is “limited or uncertain availability of nutritionally adequate and safe foods or uncertain ability to acquire acceptable food in a socially acceptable ways” (Coates, Swindale, and Bilinsky, 2007).

It is believed that people who frequently do not have enough to eat according to accepted cultural norms created a crisis. For this reason, the phrase ‘food insecurity’ was used to describe the instability of national or regional food supplies over time. It was then expanded to include lack of secure food provisions at the household and individual level. Food insecurity concern may be due to either inadequate physical availability of food supplies, poor access among the population, or inadequate utilization of food (Hamelin et al., 1999).

Food insecurity was conceived primarily as a supply issue at an aggregate level because of the significant short falls in food supply and high food prices in the world market in the early 1970’s. However, despite the favourable supply conditions and low food prices after the mid 1970’s the incidence of food insecurity remained high in many developing countries (Clay, 2002).

According to Garrett and Ruel (1999) the main determinants of food insecurity in urban context are: food availability, food supplies into market, food access, purchasing power, access to market food utilization, health and mobility status. Variation in national, regional or local availability of food can contribute to food insecurity. Garrett and Ruel (1999) suggested that achieving household food security depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food.

Food insecurity and hunger are conditions resulting from financial resource constraint. Food insecurity can be “chronic” or “transitory”. Chronic food insecurity is a sign of poverty and shows a long-term structural deficit in food production and lack of purchasing power. Chronic food insecurity can translate into a higher degree of vulnerability to famine or hunger (FAO, 2003b).

Chronic food insecurity occurs when a household is persistently unable to meet the food requirements of its members over a long period of time. It, therefore, afflicts households that persistently lack the ability to either buy food or produce their own. Structural factors contributing to chronic food insecurity include poverty, the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2003b).

Transitory food insecurity, on the other hand, implies a short-term variability in food prices, production and income (Maxwell & Smith, 1992). Thomson and Metz (1999) were of the view that, transitory food insecurity is a

temporal or seasonal shortage of food because of unexpected factors for only a limited period and it is often triggered by seasonal instability in food supply or availability and fluctuations in prices and incomes. Wunderlich and Norwood (2006) also indicated that, transitory food insecurity refers to a temporary decline in a household's access to enough food. It results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness, unemployment, instability in food prices, production, household income or combination of these factors.

Transitory food insecurity can be further divided into temporary food insecurity and cyclical or seasonal food insecurity. Temporary food insecurity occurs when sudden and unpredictable shocks a household's entitlement. Seasonal food insecurity occurs when there is a regular pattern of inadequate access to food. Transitory food insecurity may lead to chronic food insecurity, depending on how severe it is and how frequently it occurs. In its worst form, transitory food insecurity can result in famine (Thomson & Metz, 1999).

According to FAO (1996), there are two levels of food insecurity, macro-level (food supply insecurity) and micro-level (food consumption insecurity). Food supply insecurity is the national aggregate insecurity which arises when a country is unable to supply its aggregate food requirement either through domestic food production, imports or run-down of stocks and reserves. On the other hand, food consumption insecurity exists when certain individuals or groups cannot gain access to adequate food given their incomes and the price and availability of food. Consumption food insecurity may exist within food supply security thus, certain group of people may lack adequate food although a country may possess adequate aggregate food supplies to meet needs.

Thus, national aggregate insecurity entails household food insecurity. On the other hand, household insecurity can exist regardless of the status of aggregate national or regional food supply.

Food insecurity is a national level problem. It occurs in countries that experience variations in production or inadequate production to meet consumption needs. These countries cannot smoothen their production variability through domestic carry-over or have a population whose consumption habits regularly exceed absolute production capacity. In such situations, household level actions, at least in the short run, puts pressures on national governments which in turn frequently turn to international markets, either for commercial or concessional food imports. Ultimately, however, in order to achieve food security, insecure states must establish and carry out national policies to improve their adaptive capacity (Hopkins, 1996).

In most of sub-Saharan Africa countries, food insecurity affects the urban poor more severely as they are mostly dependent on the market, unlike their rural counterparts who are able to exploit natural resources to provide for food or to generate income. The major challenge to food security in Africa is the underdeveloped and underperforming agricultural sector that is characterized by over-reliance on primary agriculture, low fertility soils, ecological degradation, significant food crop loss both pre and post-harvest, low levels of education, social and gender inequality, poor health status, cultural insensitivity, natural disasters, minimal value addition, product differentiation and inadequate food shortage of preservation that result in significant commodity price fluctuation (Kolavalli, Flaherty, Al-Hassan & Buah, 2010).

The type of food insecurity observed in sub-Saharan Africa is a combination of widespread chronic food insecurity, resulting from continuing or structural poverty, transitory emergency-related food insecurity, which occurs in periods of intensified pressure caused by natural disasters, economic collapse, or conflict (FAO, 2004).

Many factors have also contributed to food insecurity including the high prevalence of HIV/AIDS, an overall decline in farm input investment including fertilizers, seeds, and technology adoption. Other causes include: limited access to agriculture-related technical assistance, and lack of knowledge about profitable soil fertility management practices leading to expansion into less-favourable lands. A significant amount of the food is lost through pre- and post-harvest losses (Vorley et al., 2007).

A study by Mwanki (2005) reported that, the root cause of food insecurity in developing countries is the inability of people to gain access to food due to poverty. According to Bonnard (1995), much of the sub-Saharan African population, particularly in rural areas, experiences some degree of hunger over or “hungry” season, when food stocks dwindle. Migration of male labour was also recognized as a cause of seasonal hunger.

Food insecurity in Ghana is concentrated in the rural areas. Majority of the Ghanaian rural population chronically suffer from mass poverty in more severe situations than the urban dwellers. In 2009, 19% of rural households were food insecure as compared to 10% of urban household's. Undernourishment and malnutrition are common in rural Ghana and very large proportion of peasant farmers live under the absolute poverty line (MoFA, 2013).

Household Definitions and Household Food Security Concepts

Household Definition

A 'household' refers to collective identity of a group of individuals unified by commonly held endowments and one or more of the following: a common budget arising from greater or lesser degrees of income pooling, common cooking quarters, and a common residence (Bryceson, 1980). A household is "a co-residential unit, usually family based in some way, which takes care of resource management and the primary needs of its members" (Rudie, 1995). The Bangladesh Bureau of Statistics defines the household as "an individual or a group of people living in a physical unit who make common provision for food and other essentials of living" (Rudie, 1995).

Households are not static entities but restructure over time due to internal and external factors. Internal factors include: birth, death, marriage marital conflicts such as separation, divorce or abandonment, and the need for child care and care for the elderly. External factors include housing problems, lack of income, education, health care, and security. Small nuclear households can be merged into larger extended ones in times of crisis. Similarly, large extended households can break down into smaller nuclear households to avoid conflict, or when children marry and start a household of their own (Pennartz & Niehof, 1999)

Households also restructure as a result of or in order to avert vulnerability (Moser, 2012). Many definitions and descriptions of household from different social scientists have been put forward looking at it from different angles. Examples are, households are the basic unit of human social organization. To a large extent, they represent the arena of everyday life for the

vast majority of the world's people. A household and a family provide the crucial linkage of the individual and society as a whole, the point of linkage between the activities of individuals (agency) and the levels of institutional and social structure with which the individual interacts (Clay & Schwarzweller, 1991).

The concept of household food security is a more recent development and the bulk of literature dates from 1980s. Household food security involves a household having assured sets and or government assistance programmes such that in times of need they will be able to maintain sufficient nutritional intake for physical well-being (Frankenberger, 1992).

Household food security is the application of the food security concept to the family level, and includes individuals within households as the focus of concern. In general, a household can be said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a household should be able to cope with short-term changes without sacrificing the nutritional needs of any of its members. Food access refers to the ability of a household and its members to acquire enough food through production, exchange or transfer. Once the basic sources of food have been identified, it is necessary to investigate the often-complex interaction of agro-physical and socioeconomic processes that limit a household's ability to obtain sufficient quantities of food from each source (USAID, 2003).

Household food security has been widely accepted to mean the ability of individuals and households located in specified geographical boundaries to meet staple food needs on a year round basis from their own enterprise

production or through purchases from domestic markets. A food secure household should be defined as one which has enough food available to ensure a minimum necessary intake by all members. The minimum is related to among other things, body size, weight, sex, nature of work and for women, pregnancy or lactation status (Diriba, 1995).

Debebe (1995) indicates that, household food security is mainly conditioned by factors, which are related to the process of “acquisition, household procurement strategies and socio-economic condition of the society.” Access to different resources and the pattern of social support have greater impact on the procurement strategies of food supplies. The basic resources like cash, labor, land, market and public services determine the possibilities of increasing entitlement to food, which are the key components for either promoting food security or aggravating vulnerability to food insecurity. However, none of them by their own right are sufficient to affect food supplies.

The key element that is critical to household food security are availability and stable access. The former is further influenced by the different source of food and handling patterns, which facilitate the time dimension of food availability in the household. Households are identified as food secured if entitlements of demand for food security is greater than food needs, which is defined as the aggregation of individual requirement (Thomson & Metz, 1997). Food security analyzed at the household level is conditioned by a household’s own food production and household members’ ability to purchase food of the right quality and diversity in the market place (Alderman, 2005).

Household social capital can affect food security indirectly, in two possible ways, by increasing the dependency ratio, which is the number of individuals in the household relying on a working household member, or increasing the resource base of the household. A large dependency ratio can exacerbate food insecurity directly by creating more mouths to feed and putting more pressure on available resources. Alternatively, it can ameliorate food insecurity indirectly by increasing the resource base of the household, by increasing the number of household members who are earning incomes for households with other resources. Some of these relationships may also differ by the family structure of the household (Barrett, 2002).

The food security status of the household has an impact on the level of agricultural productivity in the farm. When individuals face very severe food insecurity either because of limited access or utilization, this affects their abilities to act as a source of labor supply and reduces their food production possibilities (Asenso-Okyere, Chiang, Thangata, Andam & Mekonnen, 2011). The relationship also works in the opposite direction, as agricultural productivity affects food security directly by increasing the available supply of food, particularly for subsistence households, and indirectly by increasing incomes (Adams & Bumb, 1979).

Gender and Household Food Security

Gender and household food security are linked in fundamental ways. Women are the caretakers of household food and nutrition security. In female-headed households, more resources are allocated for household food security and the nutrition of children than in male headed households. Female headed

households where women control assets and resources spend more on education and health (Hallman, 2000).

Women need access to resources, including productive assets, education, organizations, social networks, credit, legal rights, and voice in the political system. Gender equality is crucial for individual food security and nutrition adequacy. For example in Bangladesh society, where there are considerable gender disparities, there is a culture of male domination and an ensuing unequal intra-household distribution of food (Cain, Khanam, & Nahar, 1979).

Men in South Asian societies have greater control over material resources, knowledge and ideology (Palriwala, 1990). Their greater control is rooted in basic social, economic and cultural systems (Sen, 1994). Women generally play a crucial role in both food production and consumption. Longhurst (1983) points out that “in rural economies, women are the pivot between production and consumption”. They are literally the gatekeepers to household food security and individual nutrition (Niehof, 2003). At the same time, due to cultural norms, women tend to take less nutritious foods than needed for their caloric and nutritional requirements (Kempson, Keenam, Sadan & Adler, 2003). As it is, individual food security and nutrition is seriously affected by gender discrimination. In Bangladesh, like in other South Asian countries, women are undernourished as a consequence of their low status and weak bargaining power, which is reflected in pro-male biased food distribution (Bouis, 2003).

Linkage between Subsistence Production and Household Food Security

There is a general consensus that households access food mainly through three sources. These are the markets, subsistence production and transfers from public programmes or other households. These sources are also referred to as entitlement categories: production, exchange (barter or purchase) and transfers (Scherr, 1999). Historically, rural households produce most of their own food, whereas urban households purchase most of their food (Saito, 1994). In most of sub-Saharan Africa including Ghana, food insecurity affects the urban poor more severely as they are mostly dependent on the market, unlike their rural counterparts who are able to exploit natural resources to provide for food or to generate income.

While farming still remains important for rural households, people are looking for diverse opportunities to increase and stabilise their incomes. Therefore rural livelihoods are based not solely on agriculture but on a diverse array of activities and enterprises (Chapman & Tripp, 2004).

Peasant farmers have the potential to play an important role in reducing sub-Saharan Africa's food deficit. Subsistence production or smallholder production can increase food supplies and thus cushion households from food price shocks (World Bank, 2007).

Determinants of Household Food Security

Household's potential towards food availability, access and utilization is a function of different variables. In a study conducted in Bangladesh, it was found that household food security is significantly correlated with some household's characteristics like the level of education of the household head, livestock ownership and land ownership (Faridi & Wadood, 2010). FAO (2001) concluded from a study conducted in Southern Ethiopia that, the

determinants of food security can be found at both the supply and demand side. Determinants such as agricultural technology adoption, farming systems, farm size, land quality, per capita aggregate production and access to market were seen as having a deterministic relationship with household food security.

However, despite the above factors among others set as determinants of food security, it is worth recognizing that they don't act in isolation. They instead interact with other institutional and natural factors that are at some point uncontrolled at household level. Consequently, we argue that food security improvement at the household level is in the hands of not only individual households' efforts but also other actors like the government, private sector and civil society (FAO, 2001).

Factors used to explain the differences in food security between households include income, household land holdings, employment status, household productive asset endowments and household composition. The most common asset in rural areas is landholding and this is a good indicator of poverty when income is unobserved (Ravallion, 1989). Households with small farms are prone to food insecurity. In addition, land quality has been found to provide a good amount of yield on farms. In most communal areas, farms are of relatively poor quality and require the use of chemical fertilizer (Rutsch, 2003).

A household productive asset such as livestock also contributes to household food security of rural population. A study on livestock was conducted by Ndlovu (1989), which focused on the role of ruminants in promoting food security in farming systems in the SADC region. Ndlovu (1989) found that, livestock were important to food security in the SADC

region as they were a source of manure, draught power, cash income, food (milk and meat) and as long-term investments. Household access to food depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow their own food (Garrett & Ruel, 1999). Farm households derive their income from many sources including crop and livestock sales, wages, salaries, remittances and small enterprises. These small enterprises include basket making, brick making and selling of fish.

The contribution of each source to total income and its reliability varies greatly between households. Factors contributing to this variation include agro-ecological conditions, wealth and income levels (Jayne, Jones, Govereh, Nyoro & Reardon, 1994). Off-farm labour employment is an important source of income for most smallholder farmers. Off-farm income is positively associated with total income (Meade, Rosen, & Shapouri, 2007). Some studies have also shown that off-farm income has a positive effect on the adoption of expensive traction technology and good quality inputs, which results in high productivity levels (Zindi & Stack, 1991). Thus, it is clear that income diversification can have a positive effect on food access by increasing incomes and investment in agriculture (Jayne et al., 1994).

Chopak (1986), carried out a study on family income sources and food security. The study revealed that, access to food by farmers depended on their entitlements, which included a set of all alternative bundles of commodities that a person can obtain legally by using his or her endowments. Chopak (1986) further indicated that, there can be food insecurity even without any fall in food availability due to a variety of other variables such as loss of

endowments, loss of employment, a fall in wages, or unfavourable shift in terms of trade of food exchange for assets. Clark (1985) was also of the view that, ownership of other productive assets such as farm equipment (ploughs, cultivators, labour and draft power) may be reasonable proxies for food security status of households.

In a similar manner, Workneh (2006) argues that, household food security needs to be seen from the dimension of availability and access (the ability to purchase food from the market). He further elaborated that, food security within the household is determined by the ability of the household to produce its own food and increase its purchasing power (Workneh, 2006).

According to Nyariki and Wiggins (1997) access to food in household implicitly depend on the ability to make use of natural, physical and human resources efficiently. This means that, availability of resources such as land and labour play a prominent role in food production and the capacity to sufficiently make use of these resources determines the food security status of the household. That means if the household depend on food markets, they are obliged to raise a substantial amount of additional income from elsewhere. It could be by selling what they harvested or engagement in off-farm activities.

Similarly, Slade (1986) stated that off-farm activities are essential means to attain food security by enhancing purchasing power or in-kind income. He further argues that, what affects farm production, farm income and off-farm activities, does affect household food security status indirectly.

A study conducted by FAO (2001) showed that, a households' ability to achieve food security is derived from the household's human, material, and institutional resource base, which are often collectively referred in the literature

as “food security factors.” These factors include the educational and employment status, household demographics, urban agriculture, assets, savings, formal social assistance, direct transfer, informal social networks, access to clean water and sanitation, and cost of living.

Other factors that affect household food security include household demographic characteristics such as the presence of children and elders, gender of the household head, educational level of the household head and other members of the household (Iram & Butt, 2004). Family size is identified as one of the important demographic factors that affect household food security status. Family size has a positive relationship with food insecurity status of a household. Households with large family size are food insecure than those with small numbers (Ibrahim & Bello, 2009).

Age of the household head is a variable that affect food security status of the household. Older aged household heads have a chance of being food insecure than younger ones. This is possible because older household heads are less productive and they lead their life by remittance and gifts. (Hamelin et al., 1999).

Educational level of the household head affects food security situation. Literate households are less food insecure than illiterate households. The possible explanation is that the household heads educational level largely contributes to working efficiency, competency, diversified income, adopting technologies and becoming visionary in creating conducive environment to educate dependants with long term target to ensure better living condition than illiterate ones. Thus educated household head plays a significant role in shaping household members. In a study conducted in Bangladesh, it was found

that household food security is significantly correlated with the level of education of the household head (Faridi & Wadood, 2010).

Measuring Household Food Security

Food security measurement refers to the measurement of experiences of dietary consumption at the household and individual levels. Food insecurity at the household level is realized as a series of experiences or decisions that take place as resources diminish (Radimer, Olson, Greene, Campbell & Habicht, 1992).

Hoddinott (1999) argues that, there are approximately 450 indicators of food security and it is difficult to measure food security. He further pointed out that, defining and interpreting food security, and measuring it in a reliable, valid and cost effective ways, had always been a stubborn problem facing researchers.

According to Maxwell, Levin, Armar-Klemesu, Ahiadeke, Ruel, and Morris (1998), food security indicators are generally categorized in two main categories: “process” and “outcome” indicators. Process indicators are divided into two: indicators that reflect food supply and indicators that reflect food access.

Outcome indicators are used to measure the status of food security at a given point in time and grouped into direct and indirect indicators. Direct indicators of food consumption include actual food consumption rather than marketing channel information. The indirect indicators include storage estimates, subsistence potential ration and nutritional status assessment (Coleman–Jensen, Nord, Andrews & Carlson, 2011).

However, there is no fixed rule as to which method to employ due to the diversified characteristics of food insecurity and the different level of consideration. The decision to rely on a particular method usually depends on resource and time constraints, objectives of the study, availability of data, type of users and degree of accuracy required (Debebe, 1995).

Reliable and adequate detailed information about the food security of a nation's population is important for the development of policies and programmes to increase food security and reduce food insecurity and hunger (Maxwell et. al., 1998).

Devising an appropriate measure of household food security status is useful for several reasons. However, obtaining detailed data on dimensions of household food security such as 24 hour recall data on food intake can be time consuming and expensive and requires a high level of technical skill in both data collection and analysis. Farm household production and food security analysis at the household level requires understanding of the household's ability to either produce enough food or generate enough income to purchase food (Frongillo, 1999).

A collaborative effort of interagency working groups, operating under the leadership of the Food and Nutrition Service of the United States Department of Agriculture (USDA), developed a comprehensive benchmark measure of household food security. Prior research on females experiencing hunger provided a conceptual framework, description and definition and survey items of hunger (Maxwell et al., 1998).

A hunger scale was used in numerous surveying point for the development of the household food security module (HFSM). Based upon this

work, widely accepted definitions of food security and the United States HFSM have been extensively used. The US HFSM was not intended to be a universal measurement of food security. It has since however been used in Canada and Australia and has been adapted for use in developing countries that are culturally, linguistically and economically different from the US (Maxwel et al., 1998).

The United States (US) Food Security Measurement Project developed and implemented a survey to help provide information on household food security of households in the United States. The food security status of each household was assessed by their response to eleven (11) questions about food-related behaviours, experiences and conditions that are known to characterize households having difficulty in meeting their food needs (Maxwell et al., 1998).

Based on their food security scale scores, households were classified into four categories namely: high food security, moderate food security, low food security and very low food security (Maxwell et al., 1998).

The questions used in the module were as follows:

1. Obligated to eat less preferred food;
2. Need to borrow food to meet social obligations;
3. Took food (usually staples) on credit from a local market;
4. Worried frequently about where the next meal would come from;
5. Need to purchase food often (because own production or purchased stores ran out);
6. The family ate few meals per day on regular basis;
7. The respondent adult cut back on amount of food consumed (owing to

- lack of food);
8. Need to borrow food from relatives or neighbours to make a meal;
 9. The main working adult sometimes skipped entire meals (owing to an insufficiency of food in the household);
 10. There were times when food stored in the house ran out, and there were no cash to buy more;
 11. Other adults (not the main working adult) personally skipped entire meals (Maxwell et al., 1998).

The set of food security questions have been combined into a single overall measure called the food security scale. This is a continuous, linear scale which measures the degree of severity of food insecurity/hunger experienced by a household in terms of a single numerical value which ranges from 0 to 11.

In interpreting the scale, it is important to remember that what it measures is the sufficiency of household food as directly experienced by household members and not necessarily the nutritional adequacy of diets.

The interpretations of the scores are as follows: “High food security” means a respondent scored at most two out of the eleven questions. “Moderate food security” means a respondent scored between three and five. Respondents who score between six and eight are classified as “low food security” while respondents who scored between nine and eleven are also classified as having “very low food security” (Maxwell & Wiebe, 1999).

According to USDA (1995), the food security status of each household lies somewhat along a continuum extending from high food security to very low food security. The continuum is divided into four ranges and characterized as follows as shown in Table 1 below:

Table 1: Range of Food Security in the Household

	Old label	New label	Description of conditions in the household
Food security	Food secured	High food security	No reported indications of food-access problems or limitations
		Moderate food security	One or two reported indication typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake
Food insecurity	Food insecurity without hunger	low food security	Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake.
		Very low food security	Reports of multiple indications of disrupted eating patterns and reduced food intake

Source: USDA 2006 (<http://www.ers.usda.gov/Briefing/FoodSecurity/labels.htm>.)

High food security: households had no problems, or anxiety about consistently accessing adequate food.

Marginal food security: households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.

Low food security: households reduced the quality, variety and desirability of their diets, but the quantity of food intake and the normal eating patterns were not substantially disrupted.

Very low food security: at times during the year, eating patterns of one or more household members were disrupted and food intake reduces because the household lack money and other resources for food.

Placement on this continuum was determined by the household's responses to a series of questions about behaviours and experiences associated with difficulty in meeting food needs.

Role of Women in Ensuring Household Food Security

Women are crucial in the translation of the products of a vibrant agricultural sector into food and nutritional security for their households. When women have enough income, substantial evidence indicates that the income is more likely to be spent on food and children's needs. Women are generally responsible for food selection and preparation for the care and feeding of children. Women are the key to food security for their households (Quisumbing, Brown, Feldstein, Haddad, and Peña, 1995).

In rural areas the availability and use of time by women is also a key factor in the availability of water for good hygiene, firewood collection, and frequent feeding of small children. In sub-Saharan Africa, transportation of supplies for domestic use, fetching fuel wood and water is largely done by women and girls on foot (Alderman, 2005).

Government Policy Supporting Women Farmers in Ghana

The Food and Agriculture Sector Development Policy (FASDEP) is a policy of the Government of Ghana that guides the development and interventions in the agriculture sector. The first Food and Agricultural Sector Development Policy (FASDEP I) was formulated in 2002 as a holistic policy, building on the key elements of Accelerated Agricultural Growth and Development Strategy (AAGDS),

and with a focus on strengthening the private sector as the engine of growth. FASDEP II seeks to enhance the environment for all categories of farmers in Ghana, while targeting poor, risk prone and risk-averse producers (MoFA, 2010).

The policy document establishes the challenges faced by women farmers in relation to access to resources such as limited access to land, labour and capital due to cultural and institutional factors. Due to inadequate gender mainstreaming, extension planning, delivery and content may not address the needs and conditions of women farmers. Gender inequality in the agriculture sector has undermined the achievements of sustainable agricultural development because programmes and projects are not systematically formulated around different needs, interests, roles, responsibilities, status and influence in society of women and men (MoFA, 2010).

The Gender and Agricultural Development Strategy (GADS) for MoFA has eight key strategies which are being used as the basis for mainstreaming gender into the policies and programmes of the agricultural sector. The focus has however been narrowed with only six out of the eight (8) strategies being implemented. The six strategies are below:

1. Strengthening institutional capacity for effective gender mainstreaming.
2. Advocating affirmative action in recruitment and training within MoFA.
3. Ensuring gender disaggregation of data in MoFA.
4. Ensuring collection, use and maintenance of gender disaggregated data at all levels.
5. Prioritizing a key gender mainstreaming strategy annually for implementation.

6. Promoting systematic and regular gender analysis of agricultural programmes to ensure they do not increase the workload of poor women and men farmers.

The GADS provides a framework for achieving a “gender-sensitive” agricultural sector and identifies seven objectives as below:

1. Enhance the institutional capacity of MoFA to address gender issues.
2. Promote production and use of sex and age disaggregated agricultural data.
3. Improve access by farmers to financial services.
4. Improve access to information on land rights.
5. Develop and promote improved and appropriate technologies in agriculture.
6. Promote the diversification and development of new processed products.
7. Enhance environmental protection through appropriate agricultural practice (MoFA, 2010).

Mohiuddin and Poonam (1991) recommended that, any effort to increase food production to raise food security of poor rural households must first address the needs of women producers. Addressing production resource constraints of farmers for agricultural productivity would attack poverty from three different dimensions: It increases the productivity, food security and incomes of the majority of smallholder farmers (men and women); it reduces food prices, which governs real incomes and poverty in urban areas; and generates important spill-overs to the rest of the economy (MoFA, 2010).

Hence the motivation of African leaders to sign the Maputo Declaration on Agriculture and Food Security in 2003 at the African

Union Summit, which committed their Governments to allocate at least 10% of national budgets to agriculture in order to achieve 6 percent annual growth (MoFA, 2010).

Challenges to Food Security in Africa

The major challenge to food security in Africa is its underdeveloped agricultural sector that is characterized by over-reliance on primary agriculture, low fertility soils, minimal use of external farm inputs, environmental degradation, significant food crop loss both pre-harvest and post-harvest, minimal value addition, inadequate food storage and preservation that result in significant commodity price fluctuation. Ninety five percent of the food in sub-Saharan Africa is grown under rain fed agriculture. Hence food production is vulnerable to adverse weather conditions. There is an overall decline in farm input investment including fertilizers, seeds, and technology adoption (Al-Sultan, 2000).

Access to fertilizer use is constrained by market liberalization and trade policies that increase fertilizer prices relative to commodity prices, limited access to markets and infrastructure, limited development of output, input, credit markets, poverty and cash constraints that limit farmer's ability to purchase fertilizer and other inputs. The soils continue to degrade leading to a reduction in the productivity of the farms. Some of the causes of soil fertility depletion in Africa include the limited adoption of fertilizer replenishment strategies, poor soil and water conservation measures, decline in the use and length of fallow periods, expansion of agricultural production into marginal and fragile areas, and the removal of vegetation through overgrazing and logging (Mwanki, 2005).

Other causes include rapid population growth, limited access to agriculture-related technical assistance, and lack of knowledge about profitable soil fertility management practices leading to expansion into less-favorable lands. A significant amount of the food is lost through pre- and post-harvest losses. The tropical climate make the foods produced in these regions prone to pests and diseases. Poor handling and storage further increase the post-harvest losses. Management of the African agricultural system is further complicated by the existence of diverse heterogeneous systems (Mwanki, 2005).

Efforts by Governments in Africa to Ensure National Food Security

A number of new initiatives, both in Africa and internationally, have been undertaken to ensure food security in Africa:

1. Comprehensive African Agricultural Development Programme (CAADP) in 2003.
2. The Global Donor Platform on Rural Development in 2006.
3. The FAO Voluntary Guidelines on the Right to Food in 2006.
4. The Alliance for a Green Revolution in Africa (AGRA) in 2007.
5. The European Union's Advancing African Agriculture communiqué in 2007.
6. The World Bank World Development Report on Agriculture for Development in 2008.
7. The UN High Level Task Force on the Global Food Crisis in 2008.
8. The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) in 2008.

Large amount of food production in the world does not ensure any country's food security. Moreover, huge production of food at national level does not guarantee for the household food security. As a result food security has advanced from emphasizing the supply side through the individual and household level for improved access to food. This may be due to unfair distribution of resources, variation in production functions, and motives for productivity. That is why even if production increases through time; food insecurity, malnutrition and hunger would remain the main agenda and much more serious problems in the world (Barrett, 2002).

Policies and measures, which have been implemented by most countries to ensure food security, include encouraging increased agricultural production to maintain food self-sufficiency (Kandoole & Msukwa, 1992).

Developing countries can develop a two-pronged strategy to promote food security. In the long run, efforts must be made to increase the purchasing power of the poor by raising the overall level of food production in the Third World. Increased food supplies and purchasing power must be inextricably linked to elements of any long-term food security efforts. In the short run, redistributing food supplies from the developed to the developing world is likely to be the best way to meet the more immediate food security needs of the poor (Mellor, 1988).

Planning for food security by government is important for a number of reasons ranging from the quantitative supply of food to feed individuals, as well as nutrition and health issues. The changing urban and agricultural landscape as a result of the modern lifestyle is also another reason for the importance of food security. The challenges of climate change, loss of

agricultural land to urban development, infertile soils, slow productivity growth and a lack of nutritious food to some communities, highlight the importance of providing for food security (Barret, 2002).

Achieving Food Security in Ghana

Ghana faces the challenge of making substantial progress in food security because average yields have remained stagnant. Commercial food imports and food aid constituted about 4.7% of food needs in the last 15 years. Food production fluctuates from year to year due to frequent variations in the magnitude of rains during and between growing seasons. The recurrence of climate stress destroys crop and livestock. Rainfall is a major determinant in the annual fluctuations of household and national food output. Food insecurity exists at some household levels, which can be transitory in poor communities and chronic in distressed areas. In highly population density areas such as the Upper East Region, the situation is cyclic and severe for three to five months each year resulting in regional disparities in food insecurity due to seasonal food deficits in the three northern regions of Ghana (Strebelle & Nyamekye, 2011).

Using household consumption as a basis for categorization, a 2009 nation-wide Food Security and Vulnerability Analysis of Ghana confirmed that there are currently 1,200,000 million food insecure people in Ghana and an additional 2,007,000 vulnerable to food insecurity. It is the poor that are most vulnerable to food insecurity. All households in Ghana rely on the market to some degree to meet their food needs. However, a significant proportion of food-insecure Ghanaian households in rural, as well as urban localities produce some of the food they consume. For these households, hunger is

frequently associated with poor harvest resulting from environmental degradation, poor weather, natural disaster, or conflict (MoFA, 2010).

While Ghana can be classified as generally food secure, pockets of food-insecure populations exist in some regions because of acute resource limitations and lack of alternative livelihood opportunity for some individuals and households to meet their dietary needs with purchased food. The availability of food varies considerably from year to year, depending on the level of production. On the basis of imported food, the country has been self-sufficient in cassava, yam, cocoyam, plantain, millet and sorghum. Self-sufficiency in maize is usually close to 100 percent. Only small volumes of maize are imported irregularly (MoFA, 2010).

The production of fruits (mangoes, pawpaw, citrus, banana, etc.) and vegetable (garden egg, okro, pepper, etc.) are sufficient except onion which large quantities are imported annually, mainly from Niger and the Netherlands (MoFA, 2010).

For animal protein, self-sufficiency is higher for poultry and goats, a little lower for sheep and pigs and lowest for beef and dairy cattle. Available information on the livestock sub-sector indicates that, the country's meat situation is in deficit to the tune of over 95,000Mt annually. Similarly, a deficit of about 460,000 Mt is recorded for fish. The major constraints to food security and agricultural growth include farmer's reliance on rain-fed farming. Reliance on simple tools, poor access to input and financial services such as credit, inadequate food storage, poor road infrastructure and inadequate market access (MoFA, 2010).

Despite these challenges, Ghana has in many ways become an African success story when it comes to reducing hunger and poverty. According to the Food and Agricultural Organisation (FAO) of the United Nations, Ghana has already met the Millennium Development Goal 1 of halving poverty by 2015, and reducing the proportion of undernourished people from 27 per cent in (1990 – 1992) to 5 per cent in 2005-2007. The FAO characterizes 1.2 million Ghanaians as undernourished while the Ghanaian figures show that 14 per cent of children are underweight and 28 per cent are stunted due to malnutrition. Over 80 per cent of children and 48% of women in rural Ghana are anaemic (FAO, 2010). Studies shows that, the key to reducing poverty is productivity growth in food staple crops which will have the effect of lowering food prices and increasing incomes since most farmers are not food buyers. Empowering women is also a key to achieving household food security (Olumakaiye & Ajayi, 2006).

A recent impetus to agriculture development in Ghana is the New Alliance for Food Security and Nutrition popularly referred to as the New Alliance. The New Alliance is a commitment made by G-8 nations to achieve sustained and inclusive agricultural growth over the next ten years, to lift fifty million people out of poverty. The New Alliance hopes to achieve this by increasing domestic and foreign private investments in Africa agriculture, fostering innovations that enhance agricultural productivity, and reducing the risk borne by vulnerable economies and communities (MoFA, 2013).

Ghana and her development partner and other stakeholders place great value on the need for food security and so over the years, a large part of their resources have been committed to its attainment. As at December 2013, Ghana

was food secure in most of its major staples. The challenge however, has been how to maintain this singular achievement. Efforts for that matter were directed to strengthening the food security status of the nation and also make efforts to improve the production of the crops in which the country is yet to be food secured e.g. rice (MoFA, 2013).

The METASIP sets out clear strategies to accomplish the objective of food security through productivity improvement, support to improved nutrition, support for diversification of livelihood options of the poor with off-farm activities linked to agriculture, food storage and distribution, and instituting early warning systems and emergency preparedness. Additional strategies include irrigation and water management and provision of mechanization services (MoFA, 2013).

Coping Strategies Adopted by Households in Meeting their Food Security Needs

Coping strategies can be defined as a response to adverse events or shocks (Devereux, 2001). Households experiencing limited resources and difficulty meeting their food needs utilize a variety of coping strategies to help supplement the food they purchase. Food acquisition and management coping strategies are practices used to obtain food and maintain their food supply after it is acquired, thus avoiding food insecurity and food insufficiency (Kempson et al., 2003).

These activities range in intensity from activities like food rationing or drawing down savings, to more permanent strategies like the sale of assets. Farm households respond to the problems caused by seasonal and disaster related food insecurity in different ways. The range of coping and adaptive

strategies is large and differs according to particular conditions. It includes expansion of production and improving productivity, food grain purchased through sales of livestock, institutional and societal income transfer systems such as gift and relief food distribution (Kempson et al., 2003).

Asset ownership assures household consumption when incomes are insufficient. Households acquire assets that can be sold to compensate shortfalls in consumption and income. Livestock is a classic indicator of asset and they are more likely to be marketed regularly or more readily. According to some literature, most of the time households do not sell livestock unless food insecurity is severe. In drought periods, households may shift their labour resources from crop production to non-farm wage employment to ensure continued income (USAID, 2003 & Yared, 2001).

Non agricultural income earning plays an important role in providing additional income to rural households. It enhances household economy and food security by giving additional income and decreases food deficit when agricultural production falls short. When shock occurs households might also adjust their consumption patterns, by reducing their dietary intake to conserve food. They may rely more on loans or transfers and less on current crop production and market purchases to meet their immediate food needs (Shipton, 1990).

Coping mechanisms used by farm households in rural areas include agricultural employment, and certain types of off-farm employment and migration to other areas, sale of wood or charcoal, small scale trading, selling of livestock, reduction of food consumption, relying on remittance from relatives, selling of clothes etc. Some of them are likely to be implemented

only after the possibilities of other options have been pursued. In addition, households who have diversified source of income are often able to cope with crisis than others (Yared, 2001 & Dessalegh, 1991).

Households that spend a high portion of their income on food are very likely to be food insecure (Smith, 2002). The extent of dependence on non-farm income sources varies across countries and regions. Evidence from a sample of rural villages in Tanzania by Ellis and Mdoe, 2003; Chapman and Tripp, 2004 shows that, on the average, half of household income came from crops and livestock and the other half from non-farm wage employment, self employment and remittances. The proportion of non-farm income was higher for upper income groups than for the lowest income groups. The poorest households were therefore more reliant on agriculture.

In a study of 11 Latin American countries, it was found that, non-farm income accounted for 40% of rural household incomes. The extent to which households, especially rural ones, are able to feed themselves depends on non-farm income as well as on their own agricultural production, since non-farm income is used by many households to purchase their food (Chapman & Tripp, 2004). Subsistence agriculture should therefore be understood in this context of diversified income sources.

According to Santos and Soroko (1999), 61% of maize-growing households in Kenya were found to be net buyers of maize. Such households may be more interested in lower food prices than in investments to increase subsistence production. However, surpluses from off-farm income may provide farmers with the financial security that would enable greater on-farm innovation (Chapman & Tripp, 2004). Examples of negative coping strategies

adopted by rural households in meeting their food security needs are: severe reduction in food consumption, selling productive assets, reducing expenditures on basic services such as health and education, and abnormal migration (Corbett, 1988).

Other strategies include preparing food in bulk, utilizing leftovers, freezing food for later use, using food substitutions such as powdered milk for fresh, reducing or omitting unaffordable ingredients such as meat, increasing amount of inexpensive food such as potatoes and rice (Hoisington, Schultz, & Butkus, 2002). These support systems included pooling together food with others to make a meal, utilizing company donations of food to needy employees, trusting in God to make it through tough times, and receiving general help from others such as parents, family members, and neighbors to assist with food sufficiency maintenance (Kempson et al., 2003).

More severe reported strategies include selling one's blood, salvaging road kill, participating in research and committing crimes with the intent to be sent to jail. In many rural areas, individuals also rely on gardening, fishing and hunting to acquire food (Downing, 1996).

While a portion of individuals and households adopt cost-saving practices, such as buying products that are on sale and buying products in bulk, many low income households find it necessary to rely on an extensive network of public and private emergency food providers to maintain an adequate food supply (Coleman-Jensen et al., 2011).

Coping mechanisms used by farm households in rural Ethiopia included livestock sales, agricultural employment, certain types of off-farm employment, migration to other areas, requesting grain loans, sale of wood or

charcoal, small scale trading, selling cow dung and crop residue, reduction of food consumption, consumption of meat from their livestock, consumption of wild plants, reliance on relief assistance, reliance on remittance from relatives, selling of clothes, and dismantling of parts of their houses for sale (Fassil, 2005).

A study in northern Ghana, revealed that, some households reported the following as the coping strategies adopted to ensure their food security: reduction in the number of meals served, eating less preferred meals, eating wild fruits, sale of livestock, sale of durable possessions (Buah et al., 2011).

Conceptual Framework of the Study

The study builds on the theories and concepts reviewed in chapter two to develop a conceptual framework for the study. The conceptual framework has ten components. The conceptual framework depicted by Figure one (1) has solid arrows that links the boxes and circles in the diagram.

The framework was developed with a strong conviction that smallholder women maize farmers in the study areas can achieve household food security through a combined effects of many things. These include (1) improved access to agricultural production resources (land, hired labour, improved seeds, fertilizer, weedicide, tractor services and extension services). (2) characteristics of farmer such as age, sex, level of education, marital status, and land holding for maize production. (3) increase in crop (maize) yield. (4) use of part (percentage) of their harvested maize for consumption. (5) Engagement in off-farm and on-farm jobs for income. (6) sale of maize for income. (7) household food security levels of the respondents. (8) mitigation of production risk by the farmers such as failure of rains, drought, bush fires, pest

and diseases, theft and conflicts. In this study the perception of smallholder women farmers' access to the above mentioned eight agricultural production resources was measured and analyzed. Again the above specified characteristics of the farmer was measured and analyzed in addition to harvested maize yields by respondents for year 2010 and 2011 major seasons. The study also analyzed respondent's household food security levels, engagement in off-farm and on-farm paid jobs and sale of surplus maize from their harvest for income as part of other coping strategies to ensure their household food security.

In the conceptual framework, the support system that are needed to support farmers obtain the required production resources are agricultural policy and farmers' affiliation to Farmer Based Organizations. For smallholder women maize farmers to achieve household food security, all the components in the conceptual framework need to work in a synergic manner.

In this study, agricultural policy and mitigation of production risk as components of the conceptual framework were not investigated in the study. Each of the components in the conceptual framework have been discussed in relation to existing literature as shown in figure 1.

Agricultural Policy

An agricultural policy in Ghana that takes into consideration gender equality and empowerment in agriculture is important to institutionalize gender equality and empowerment in agriculture and rural development strategies to further address the challenges faced by women farmers. These challenges are related to access to resources such as land, labour, extension, tractor services, improved seeds etc. Gender related constraints reflect gender inequalities in

access to resources and development opportunities (Kabeer, 1999). Gender equality in the agricultural sector is a prerequisite for the achievement of sustainable agricultural development as it would allow for programmes and projects to be systematically formulated around different needs, interests, roles, responsibilities, status and influence in society of women and men.

It is worth mentioning that, donors these days also ensure that gender is mainstreamed in all agricultural and food security programmes and projects. This is because development policy makers and planners are becoming increasingly aware of the crucial contributions of women farmers to agricultural production and food security.

Farmer Based Organisation

A Farmer Based Organisation with participation of both men and women in decision making levels is required to push for Government support for their agricultural activities. Women tend to be invisible in policy making because they are not seen as 'productive' farmers. Regarding their participation in FBOs, they are underrepresented in management positions hence cannot communicate their production constraints even within their FBOs at the village or local level how much more influence Government policies that do not favour them (Al-Sultan, 2000).

This is important as smallholder women farmers face multiple constraints related to access to production resources. These multiple constraints means that agricultural policies targeting women need to be different from those that have historically targeted men. Farmers Organizations could play a critical role in driving the development of agriculture in Ghana by offering services to their members which is not limited to access to production resources such as

fertilizers, improved seeds, weedicides, tractor services, etc but also marketing services, policy advocacy, welfare issues and management of resources (Strebelle, & Nyamekye, 2011).

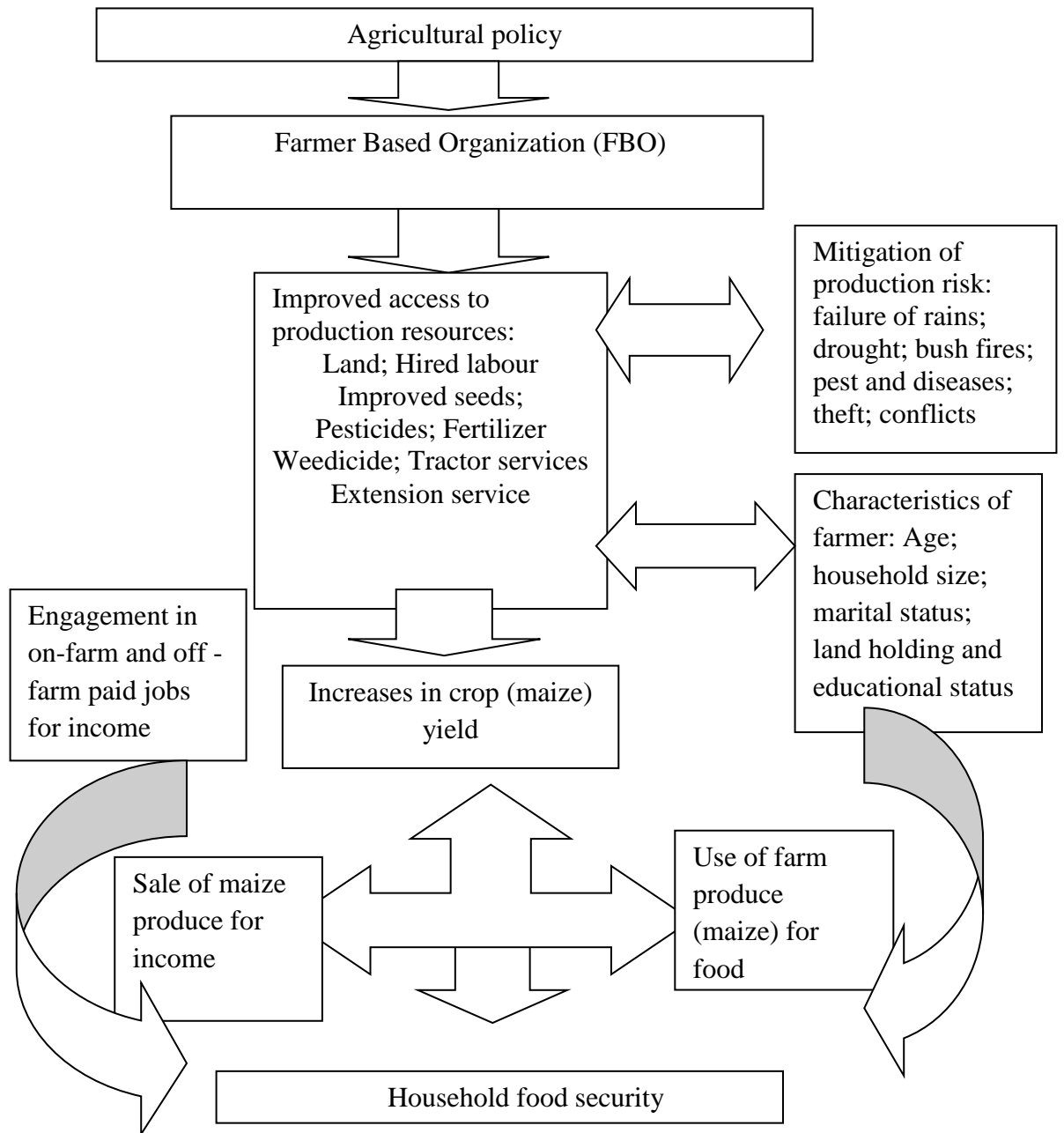


Figure 1. Conceptual Framework

Source: Author's construct, 2011.

Improved Access to Agricultural Production Resources

According to Strebelle and Nyamekye (2011), improving smallholder women farmers' access to productive resources such as land, fertilizers, improved seeds, weedicide extension services in Ghana is important for high crop output. The use of tractor services for traction eases the farmer of labour burden and thus allowing them extend area of cultivation for increased crop output. As reported by Nyachwo (2003), fertilizer is a powerful productivity enhancing input needed for crop production.

A study conducted by Peterman, Quisumbing and Behrman (2010) revealed that, female farmers show less usage of fertilizer in Ghana, Bangladesh, Pakistan and Nigeria. Land is the most important production resources for production. Improving women's access to land and security tenure has direct impact on crop yield and household food security. Generally speaking, increased crop output can most often be realized by farmers who use improved seeds, fertilizer and improved production practices (Allendorf, 2007).

Mitigation of Production Risk

Obviously agricultural production is fraught with risks and unpredictability (lack of rainfall, storms damaging crops, diseases and pest incidence, bush fires etc). Access to production resources and high inputs use do not always result in high returns. Many scholars argue that, climatic factors such as too much rainfall (flooding) or lack of rainfall (drought) cause crop failure and can lead to food shortage or famine. Climatic variability like drought or flooding have adverse impact and can cause reduced crop yield. It is worth mentioning that, bush fires, incidence of pest and diseases which are

production risks could also cause reduced crop output which affects household food security negatively (Sen, 1981).

The mitigation of production related risk such as failure of rains; drought; bush fires; incidence of pest and diseases; bush fires etc could play a significant role in enhancing female farmers' productivity and improve household food security (Tekola, 1997).

Increases in Crop (Maize) Yield

According to Nyariki and Wiggins (1997), access to food in households implicitly depends on the ability to make use of production, natural, physical and human resources efficiently which would result in increased crop yield. They further elaborated that, food security of the farming household is determined by the ability of the household to produce its own food and increase its purchasing power to increase their income.

This means the availability of resources such as land, labour, improved seeds, tractor service etc play a prominent role in food production and the capacity to sufficiently make use of these resources. Farm production may be used as food for the household. Where there are excess, it is sold for extra income to meet other food requirements of the household (Workneh, 2006).

Engagement in On-farm and Off -farm Paid Jobs for Income

When farm production is not adequate for a households' food needs, they depend on food markets. They are obliged to raise a substantial amount of additional income from elsewhere. It could be by engaging in off-farm activities as they are essential for diversification of the sources of farm households' livelihoods. It enables households to modernize their production by giving them an opportunity to apply the necessary inputs, and reduces the risk

of food shortage during periods of unexpected crop failures (Nyariki & Wiggins, 1997).

Similarly, Workneh (2006) stated that, off-farm activities are essential means to attain household food security by enhancing purchasing power and to meet their livelihood outcomes.

Off-farm labour is an important source of income for most smallholder farmers. Off-farm income is positively associated with higher and less variable total income (Jayne et al., 1994). Some studies have also shown that off-farm income has a positive effect on the adoption of expensive traction technology and good quality inputs, which results in high productivity levels (Zindi & Stack, 1991).

Engagement in non-farm activities has many advantages that are beneficial in several situations. The most significant way in which non-farm activities differ from other means of livelihood diversification is that, the agricultural risks do not apply. However, natural hazards affecting agriculture often influence the livelihood of many households. Non-farm activities are not only an attractive means of livelihood diversification with the incentive of risk minimization, but also as an additional income outside the agricultural season. Within agriculture, seasonality is the main factor determining the production cycles and hence the time of agricultural income opportunity (Ellis & Mdoe, 2003).

He points to two reasons for this. First, during the dry season, or the period between production seasons, the farmer is not occupied on his fields and therefore has the physical opportunity to be involved elsewhere. Secondly, the

own produced crops might not be sufficient for the household until next harvest (Ellis & Mode, 2003).

Consequently, the farmer might need to raise additional income, which will ensure the possibility of purchasing food in the time to come. Non-farm activities also appear as an advantageous means of diversification in relation to livelihood with the incentive of compensating for land constraints owing to their independence of agricultural constraints and providing an additional income, which compensates for insufficient agricultural gain. Also, the seasonal production cycles represented here by Reardon, are further relevant to the utilization of coping strategies (Ellis & Mode, 2003).

Incomes gained from non-farm activities tend to be much higher than those resulting from farming. For the households included in Ravallion's study, non-farm earnings even averaged approximately ten times the earnings from farming. While this must be considered context dependent, it expresses an incentive to livelihood diversification based on attempts to increase the standard of living (Ravallion, 1989).

Livelihood strategies engaged by some smallholder women farmers in Ghana includes cultivation of food crops, rearing of animals, engaging in agricultural paid jobs, sewing, agro-processing and making of handicrafts (MoFA, 2005).

A qualitative study conducted in the vicinity of the Lore-Lindu National Park in Central Sulawesi Indonesia revealed that, the farmers diversified their income and crop production by engaging in livestock production (buffaloes, cattle, horse, pigs, goat and poultry); crop production; collection and sale of forest products (collection of wood, bamboo, the juice of sugar palm as well as

hunting and collection of animals and their products); engaging in non-agricultural self employment and non-agricultural wage labour (McDonald & Moffit, 1980).

Workneh (2006) again established that, what affect farm production, farm income and off-farm activities, does affect household food security status indirectly.

Contribution of Sale of Farm Produce for Income to Household Food Security

As reported by Hussein (2004), rural households feed themselves by depending on their own agricultural production. They depend on their crop and animal production activities for feeding the household. Surpluses from their farm production are sold for income which may provide them with financial security that would enable them achieve their food security.

Characteristics of Farmer Contributing to Household Food Security

Nyariki and Wiggins (1997) investigated whether education had an effect on farm productivity using data from a large sample of 978 households living in five Chinese provinces in 1995. Their regression results indicated that education of farm workers had significant effect on farm yield and contributed significantly to their household food security.

Lipton (1968) explained that the household size of the farmer captures the size and strength of the family labour for farm activities. The availability of family and hired labour in crop production improves crop management and enhances crop yield and produce food, both for household consumption and for sale in most rural households.

As reported by Becker (1965), the marital status of a farmer is very important because it influences the household food security of the household. This is because it has implications for the amount of dependents to be fed in relation to the total crop and livestock produced on subsistence basis.

According to Adeleke, Adesiyun Olaniyi, Adelalu and Matanmi (2008), age is one of the factors that affects the efficiency of carrying out farm activities and also associated with farming experience. Age of farmers have a positive influence on their yield and contributes to their household food security.

Land holdings of farmers have implications for their crop output and household food security. This is because access to larger landholdings imparts positively on yield which translates into improved household food security of rural farmers. Increasing yield depend mostly on increasing the area cultivated (Alderman, 2005).

Use of Farm Produce (Maize) for Food Consumption

Rural households produce most of their own food which is important for household food security. Access to food in household implicitly depend on the ability of the household to produce its own food (Workneh, 2006).

Household Food Security

Households are identified as food secured if entitlements of demand for food security is greater than food needs, which is defined as the aggregation of individual requirement (Thomson & Metz, 1997). Household food security accounts for the consumption levels of all members of a household population.

Maxwell, Armar-Klemesu, Ahiadeke, Ruel, & Morris (1998) indicated that, based on their food security status, households could be classified into

four categories: “high food security”, “moderate food security”, “low food security” and “very low food security”. The study therefore adopts an operational household food security definition as “the household, having no reported indications of food access problems or shortage”.

CHAPTER THREE

METHODOLOGY

Introduction

In this chapter, where and how the study was conducted are presented. More specifically, the chapter includes the study area; research design; study population; sample and sampling procedure; instrumentation; data collection; and data analysis.

Study Area

The study was conducted in Offinso North District and Techiman Municipality which were purposively selected in the Ashanti and Brong Ahafo Regions of Ghana respectively because of the presence of high number of farmers engaged in maize production. Communities were further selected randomly in each of the selected districts based on the availability of women farmers engaged in maize production and who were also members of Farmer Based Organisations.

Offinso North District in the Ashanti Region of Ghana

The Ashanti Region is centrally located in the middle belt of Ghana. The region shares boundaries with four of the ten political regions namely: Brong-Ahafo Region in the north, Eastern Region in the east, Central region in the south and Western Region in the West (Osafo & Frempong, 1998).

The Region is divided into 27 districts. The study district in Ashanti region was Offinso North District with its capital known as Akomadan. Offinso North District lies within longitude 1⁰65w and share common boundary in the North and West with Techiman, Sunyani Tano and Nkroanza district in the Brong Ahafo Region.

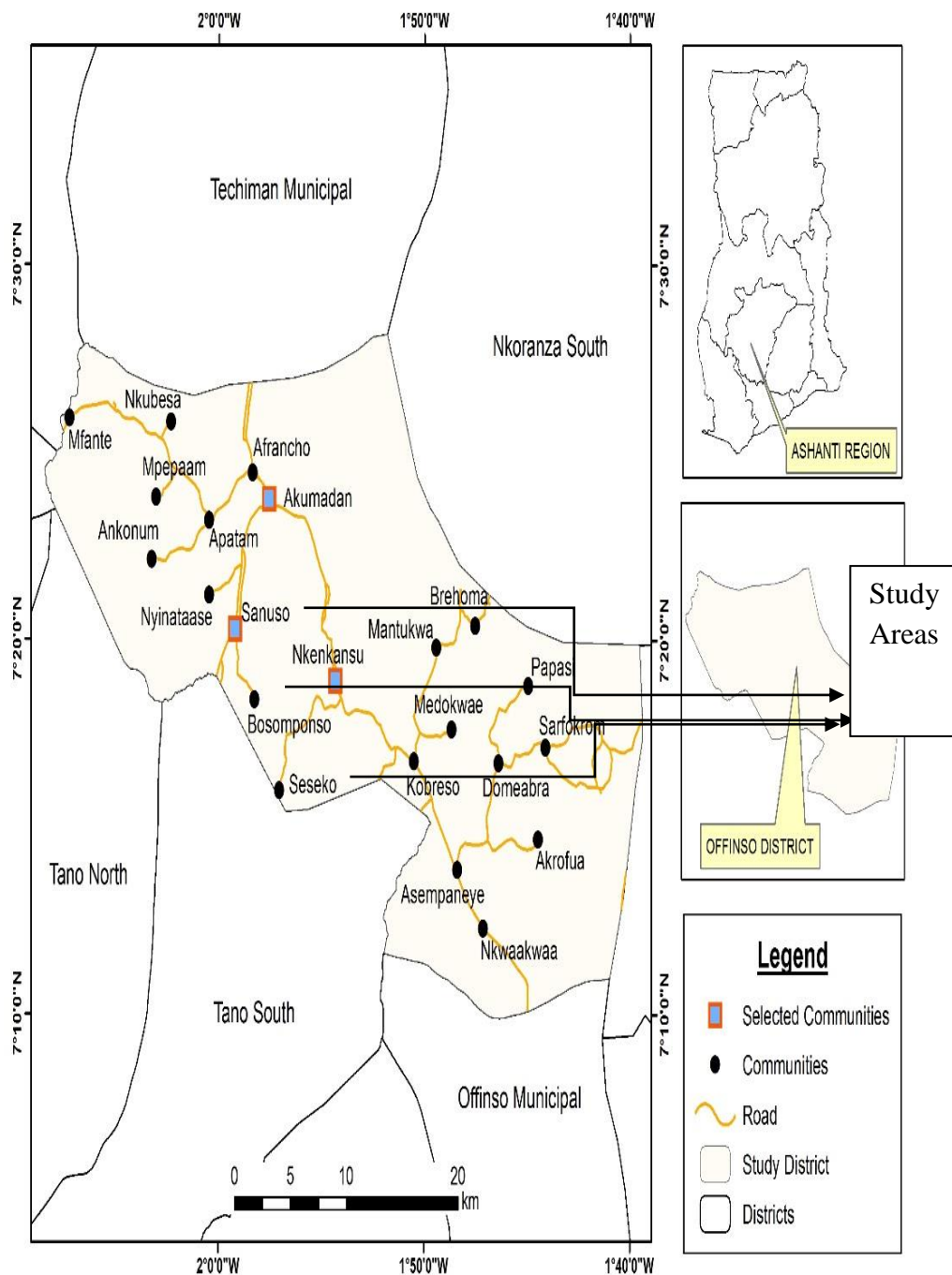


Figure 2. Map of Offinso North District Showing Study Areas

The District is also boarded on the east by Sekyedumae District, and the south by Offinso South District in the Ashanti Region. It covers an area of about 6300 square kilometers which is about 2.6% of Ashanti Regions total surface area. Offinso North district is made up of over 100 settlements with an

average household size of 6. The district is a typical rural district with about 78% of the total population living in the rural area (Osafo & Frempong, 1998).

The district lies within the semi-equatorial region with a bi-modal rainfall regime. It has a mean annual rainfall level ranging between 700mm and 1200mm (Osafo & Frempong, 1998).

The major rainy seasons are from March to mid-July whilst the minor rainy seasons are from September to mid-November, humidity is very high during the raining season, reaching the peak of 90% between late may and early June and July. The district experiences a minimum temperature of 30⁰C around March/April whilst the mean monthly temperature is 27⁰C. The natural vegetation of most part of the district is moist semi-deciduous forest with thick vegetation cover (Osafo & Frempong, 1998).

Farming is the predominant occupation of the people in the district. The sector engages over 70% of economically active labour force. However, about 60% of all the people engaged in the agricultural sector still practice agriculture as a subsidiary activity. The current total farming population is around 30,000 comprising 15,030 male and 14,970 females (Osafo & Frempong, 1998).

The district is endowed with rich and tremendous arable land that supports a wide range of crops. Agriculture is predominantly on a small-medium holder basis in the district, although there are some relatively large farms for particularly maize, yam, tomatoes and tree crops. The main system of farming is the traditional system where hoes and cutlasses are the main tools (Osafo & Frempong, 1998). Crop production is basically rain fed and the heavy reliance on the erratic rainfall regime has been identified as one of the main constraints affecting agricultural performance in the district (Osafo & Frempong, 1998).

Techiman Municipality in the Brong Ahafo Region of Ghana

The Brong Ahafo Region is located in mid-western Ghana, between the Ashanti Region and the Northern Region. Its capital is Sunyani. (Sarpong, 2010).

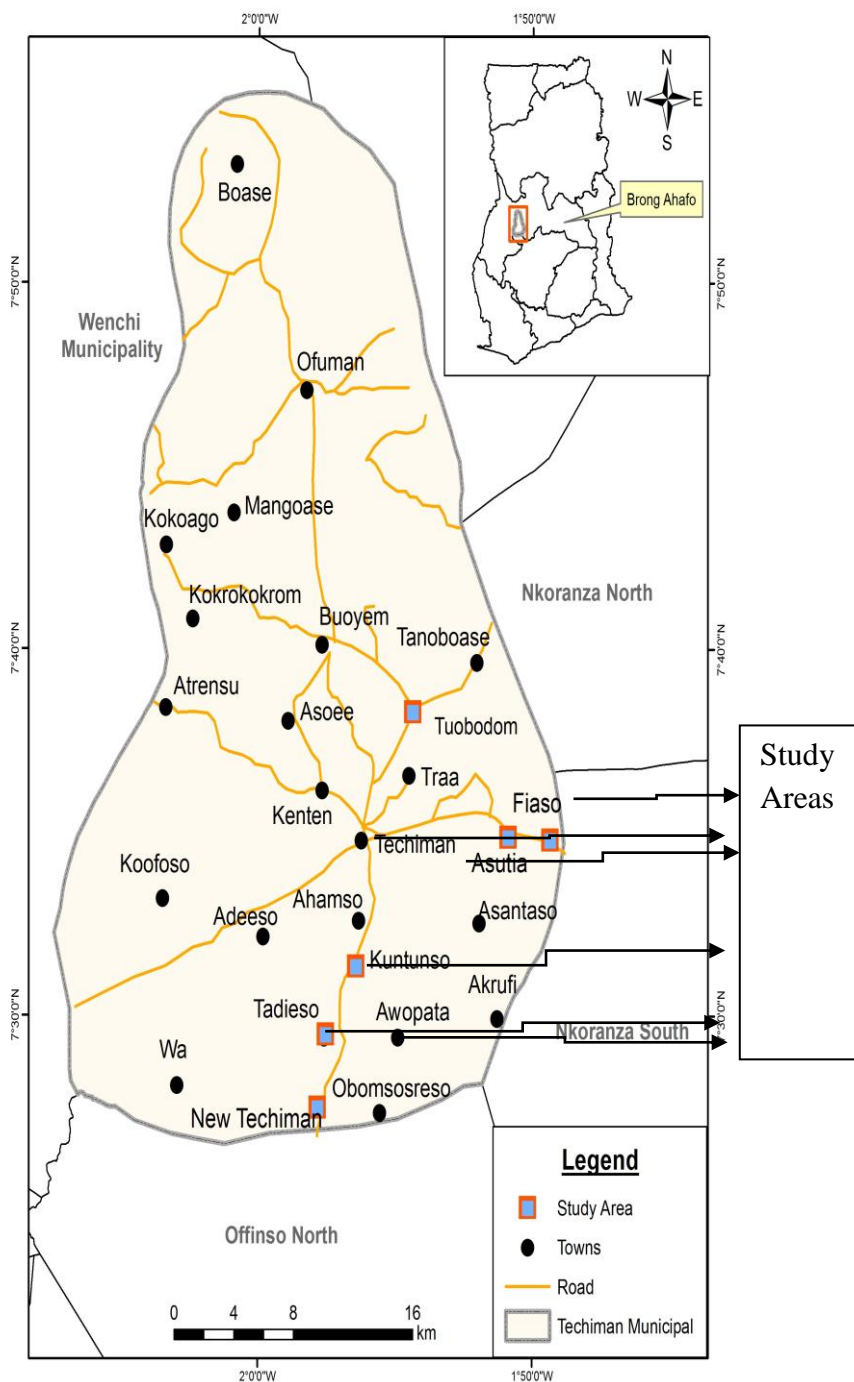


Figure 3. Map of Techiman Municipality Showing Study Areas

The Region has 19 districts. Techiman Municipality has Techiman as its capital. It has a total land area of about 669.7 square kilometers. The Municipality shares local boundaries with Wenchi Municipality to the west, Sunyani West and Offinso North District to the south, Kintampo South District to the north and Nkoranza South District to the east. Females dominate the population of the municipality (Sarpong, 2010).

The sex ratio, of male to female is 99.9 in contrast to the regional ratio of 100.8. The average household size is 5.1 as compared to the regional average of 5.3. About 34.2% of the households in the Municipality are female headed. The Techiman Municipality in general is regarded as an agricultural production corridor. This is largely attributed to the vast fertile lands, especially in the southern part of the municipality (Sarpong, 2010).

Research Design

Research design is a plan or blue print which specifies how data relating to a given problem should be collected and analyzed. The research design indicates the specific data analysis, techniques or methods that the researcher intends to use in his work. This study is a descriptive, correlation survey because it shows a relationship between two variables “access to agricultural production resources” and “household food security” of the study respondents. As defined by Hopkins (1996) a descriptive research is concerned with the conditions or relationships that exist, such as determining the nature of prevailing conditions, practices, attitudes, opinions that are held; processes that are going on; or trends that are developed.

Hopkins (1996) further explained that, descriptive research seeks to find answers to questions through the analysis of relationships between or among

variables. Correlation research attempts to investigate possible relationships among variables without trying to influence those variables. In simplest form, correlation research attempts to determine whether and to what extent or degree a relationship exists between two or more quantifiable variables.

Study Population

A study population always comprises of the entire aggregation of elements in which the researcher is interested. Most populations of interest are large and diverse and are usually, scattered over a large geographical areas. Dealing with all the individuals may be very laborious, time consuming and expensive. For these reasons, it is appropriate for the researcher to select a sample for the study (Walier, 2007). The study population were smallholder women farmers in the Techiman Municipality and Offinso North District of Ghana engaged in maize production.

Sample and Sampling Procedure

Fraenkel and Wallen (2003) defined the process of selecting individuals from a population as sampling. Sampling is the process of selecting a proportion of a population to represent the entire population. Generally, sampling enables the researcher to study a relatively small number of units in place of the target population.

A multi stage sampling procedure was used in the study to select the respondents for the study. This was to eliminate the need for a complete list of all the units in the population and also to ensure that, the population units will be chosen. It further reduces enumeration cost for the personal interviews and simplifies the field work. In the first stage, a district each was randomly selected from the two Regions (Brong Ahafo and Ashanti Regions).

Techiman Municipality and Offinso North Districts were randomly selected from the twenty two (22) and twenty nine (29) districts in Brong Ahafo and Ashanti Regions respectively. This was to give all units of the target population an equal chance of being selected for the study. Communities were also randomly selected from each of the two selected districts. This was to ensure that every community had an equal chance of being selected. For Techiman Municipality and Offinso North District, the study communities were randomly selected.

The method of random sampling used was the lottery method where study districts, communities and women farmers were selected using a sample frame. The list of districts in Brong Ahafo and Ashanti Regions of Ghana were obtained from the website of the regions. For the list of communities and farmers (FBOs), the researcher obtained the list from the MoFA District Offices.

According to Healey (2004), a sample of 100 is adequate enough to assume normal sampling distribution of means with mean equal to population mean and with standard deviation or standard error of the mean equal to population standard deviation divided by the square root of the sample size. Therefore, a total sample size of 300 was pretty adequate for the purpose of the study.

At a glance of table 2, the communities selected in Offinso North District were only three whilst that of Techiman Municipality were six. This was because the researcher was interested in interviewing 150 smallholder women farmers engaged in maize production and who were also members of FBOs in each of the study area.

Table 2: Number of Respondents Interviewed in the Study Area

Regions	Districts	Selected communities	Number of respondents
Ashanti	Offinso North District	Akumadan	65
		Nkenkansu	50
		Sanuso	35
Brong Ahafo	Techiman Municipality	Kuntunso	25
		Tabieso	25
		Awopata	35
		New Techiman	30
		Asutia	20
		Fiaso	15
Total			300

As such for Techiman Municipality, the total number of respondents interviewed in the first three communities, Kuntunso, Tabieso and Awopata were only 85, hence the need to interview other respondents from three other communities to make up for the required number (New Techiman, Asutia and Fiaso).

Instrumentation

An interview schedule was used to collect both qualitative and quantitative data from respondents. The interview schedule contained a combination of both open-ended and closed ended questions developed by the researcher and also a modification to an existing US Food security measurement questionnaire. For systematic administration the interview schedule was designed in parts (find attached at the appendix). The questions in the different parts of the interview schedule addressed specific research

objectives of the study. The questions developed by the researcher elicited information on the following: farmers socio-demographic characteristics; membership in FBOs and their participation in executive positions; level of access to agricultural production resources; challenges encountered with access to production resources and their maize yield for year 2010 and 2011 major seasons. The existing US Food security measurement questions were used to collect information on the household food security status of respondents on food related behaviours, experiences and conditions that are known to characterize households having difficulty in meeting their food needs.

The paragraph below explains how the research instrument measured respondents' household food security and access to production resources. The food security status of respondents were measured by their response to eleven (11) questions about food access, food-related behaviours, food quality, food preference, anxiety of food insecurity, experiences and conditions that are known to characterize households having difficulty in meeting their food needs. Based on their food security scale scores which ranged from 0 to 11, households of respondents were classified into four categories namely: high food security (0-2), moderate food security (3-5), low food security (6-8) and very low food security (9-11).

The questions used in the module were as follows:

1. Obligated to eat less preferred food.
2. Need to borrow food to meet social obligations.
3. Took food (usually staples) on credit from a local market.
4. Worried frequently about where the next meal would come from.
5. Need to purchase food often (because own production stores ran out).

6. The family ate few meals per day on regular basis.
7. The respondent adult cut back on amount of food consumed (owing to lack of food).
8. Need to borrow food from relatives or neighbours to make a meal.
9. The main working adult sometimes skipped entire meals (owing to an insufficiency of food in the household).
10. There were times when food stored in the house ran out, and there were no cash to buy more.
11. Other adults (not the main working adult) personally skipped entire meals (Maxwell et al., 1998).

The set of food security questions have been combined into a single overall measure called the food security scale. This is a continuous, linear scale which measures the degree of severity of food insecurity experienced by a household in terms of a single numerical value which ranges from 0 to 11.

“High food security” means a respondent scored at most two out of the eleven questions. “Moderate food security” means a respondent scored between three and five. Respondents who score between six and eight are classified as “low food security” category while respondents who scored between nine and eleven are also classified as having “very low food security” (Maxwell, & Wiebe, 1999).

Level of access to agricultural production being qualitative in nature was measured by using a likert-type scale of 1 to 4 with 1 as “do not have access”; 2 as “low access”; 3 as “moderate access” and 4 as “high access”. Respondent’s access to the following eight agricultural production resources were measured: land; hired labour; tractor services; extension services;

fertilizer; weedicide; certified seeds; and pesticides. Respondents were asked which of the eight production resources were applicable to them in terms of their perception of their access to these agricultural production resources.

In order to ensure the quality of the instrument used in the research and for correct inferences, the validity and reliability of the instrument were tested. For content validity the supervisors of the study made an assessment of the instruments. The instruments was pre-tested from 6th - 20th June, 2011. This allowed for revision of the interview schedule. The reliability of the instrument was tested to ensure consistent results as well as to provide an idea of how much variation to expect. Minor corrections were made on the interview schedule to enhance their validity and reliability. For items measured on likert type scales, Cronbach alpha Co-efficients were calculated. Cronbach alpha measures how well a set of items coefficients are internally consistent or reliable. It is a measure of squared correlation between observed scores and true scores. The theory behind Cronbach alpha is that, the observed score is equal to the true score plus the measurement error. For a reliable instrument, the reliability coefficient alpha cronbach must range from 0.00 to 1.00.

Table 3: Reliability Co-efficient of Subscale of the Research Instrument

Subscale	Number of Items	Cronbach Alpha
Level of access to production resources	8	0.9256
Household food security status	11	0.8900

Source: Survey Data (2011)

Cronbach Alpha Co-efficient of 0.9256 obtained for the subscale level of access to production resources and 0.8900 for household food security status

were within the range of (0-1) as shown in table 3 above. This means the research instrument used was reliable.

Data Collection

The main survey was conducted from 8th November, 2011 to 27th December, 2011. The interview schedule were administered by the researcher with assistance from three MoFA staff (AEA) and four National Service Personnel. The data collection mode was through face-to-face interviews with respondents due to the numerous advantages of the method which includes the establishment of a rapport with the respondent. Face-to-face interviewing also places less of burden on the reading and writing skills of the respondents and, when necessary, permits spending more time with the respondent. An interview schedule took about twenty minutes to be completed. Respondents were interviewed at their homes at both week days and week ends. Secondary data were obtained from governmental documents, periodicals, journals, articles and books to develop the literature review for the study.

Data Analysis

The data gathered was analyzed using Statistical Package for Social Science Version 15. For objective one to four, univariate analysis such as frequencies, means, standard deviations were computed. T-test was used to check for statistical significance and independence between means and results presented in tables, pie chart and bar graphs where applicable. The independent t - test which is a parametric statistics is most appropriate for statistics when a study involves two groups with the independent variable being categorical. It is used to compare the mean scores of two different groups. As such, since the study respondents were solely women farmers, the data was analyzed by study

areas (Techiman Municipality and Offinso North District) to allow for comparison of means and hypothesis testing using independent t-test. For objective five, the household food security status of each respondent was assessed by their response to eleven (11) questions about food-related behaviours, experiences and conditions that are known to characterize households having difficulty in meeting their food needs.

The US Food Security measurement explained in the literature review was used to analyse the food security status of the smallholder women maize farmers.

The questions used in the module are listed in Appendix 1.

Based on their food security scale scores, households were categorized into four categories, very low food security (0 to 2), low food security (3 to 5), marginal food security (6 to 8) and high food security (9-11). Amedahe (2002) explained that, relationships in a data can be examined through one or more of these three procedures, comparison of means, a correlation or a cross break table. In each instance, some relationships may be found. Amedahe (2002) further indicated that, when relationship between two categorical variables is of interest, it is usually reported in the form of a cross break table.

A cross break table is a table of counts from data that displays the relationship between two or more categorical variables. It is also known as a cross tabulation or contingency table. The table is presented in two dimensions, corresponding to rows and columns. One variable, the row variable, goes across the horizontal axis and the other variable, the column variable, goes down the vertical axis (Amedahe, 2002).

As such in analyzing objective six of the study which seeks to investigate the effect of access to production resource and the food security status of respondents, a cross break table was used to analyse the data. Bivariate analysis such as Chi-Square test was used to statistically test for significance in the relationship between the two categorical variables “access to agricultural production resources” and “household food security”. In testing hypothesis for the study objectives, a 0.05 alpha level was set *a priori*.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents results and discussion of the research work. First, general characteristics of the respondents are provided. This is followed by results of the study objectives and hypothesis formulated for the study.

Characteristics of Respondents

The socio-demographic characteristics of the study respondents presented under this section include: age, marital status, educational background, land holding, household size by marital status, and women in leadership positions within FBOs. These have been presented in subsequent sections in the order they are introduced here.

Age Composition of Respondents

The age structure of respondents presented in Table 4 indicates that, the mean age of respondents in both regions was 42 years. A glance at the table shows that, for the study areas, majority (93.2%) of the respondents were distributed within the age bracket of 20 - 59 years. This implies that majority of the respondents are active and stronger to engage in farming.

According to Thompson and Metz (1999), age is one of the factors that affect the efficiency of carrying out farm activities as well as a factor that can affect the probability of a farmer being successful. Age is also associated with experience in farming practices as farmers gain experience over time. It can therefore be concluded that, with a mean age of 42 years recorded, the respondents were experienced in their farming activities.

Table 4: Age of Respondents

Age (years)	Techiman Municipality		Offinso N. District		All study areas		t-value	p-value
	F	(%)	F	(%)	F	(%)		
20 -29	25	16.6	32	21.3	57	18.8		
30 -39	42	28.0	46	30.0	88	30.0		
40-49	51	34.0	48	32.0	99	33.0		
50-59	20	13.4	16	10.6	36	12.0		
60 and above	12	8.0	8	5.3	20	6.2		
Total	150	100	150	100	300	100		

Mean age for all study areas= 42; Mean (Techiman = 46.40; Offinso N. = 38.21); SD = 8.4; SD (Techiman = 8.9; Offinso N. = 7.4)

$\rho < 0.05$ * is statistically significant

Source: Survey Data (2011).

Out of a total of 300 respondents, only 20 were within the age bracket of 60 and above. This could be attributed to the fact that the farmers retire from farming because of physical weakness so they become more conservative and often work for fewer hours. An independent t-test showed that, the difference between the mean ages of respondents in Techiman Municipality and Offinso North District was statistically insignificant, $p < 0.05$.

Marital Status of Respondents

The marital status of respondents are presented in figure 5 and reported by the study areas. As illustrated in the figure, a total of 214 respondents (71.3%) from the study areas were married. This is because of the respect attached to marriage by Ghanaians. The other farmers were however single.

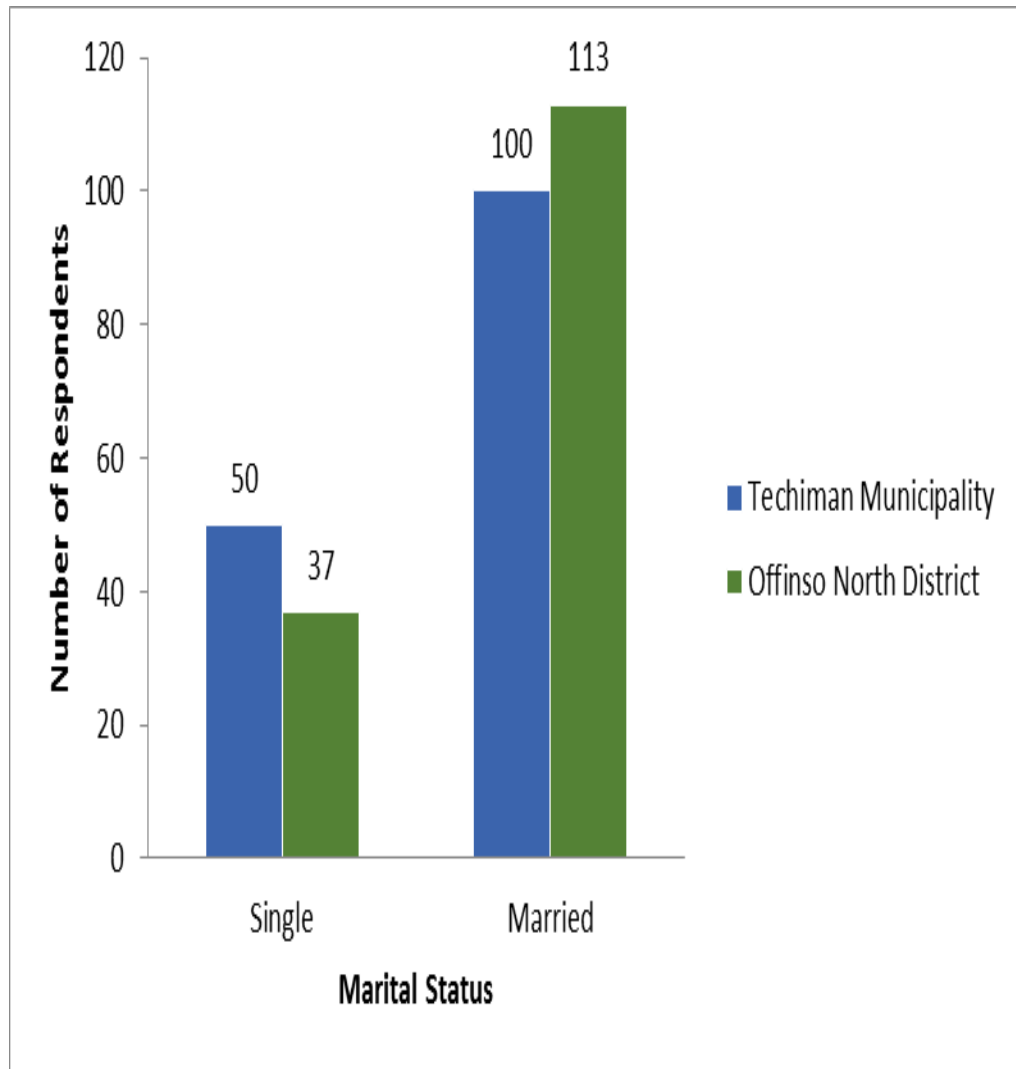


Figure 4. Marital Status of Respondents

Source: Survey Data (2011)

Educational Background of Respondents

Education, as explained by Hamelin et al., (1999) enhances crop yield directly by improving the quality of labour and to successfully adopt innovations. Education of farmers also assist them to keep better track of their costs and returns or marketing opportunities. He emphasized that the educational level of a farmer is most important to farm production in a rapidly changing technological world.

The educational level of respondents as illustrated in Figure 6 shows that for both regions, none of the respondents had attained Senior Secondary and

Tertiary Education. The highest educational attainment level was recorded in the Junior Secondary School category.

A high proportion of respondents from both study areas 238 (79.4%) had no formal education. This has implications on their usage of production resources such as reading instructions on agrochemicals which are usually written in english.

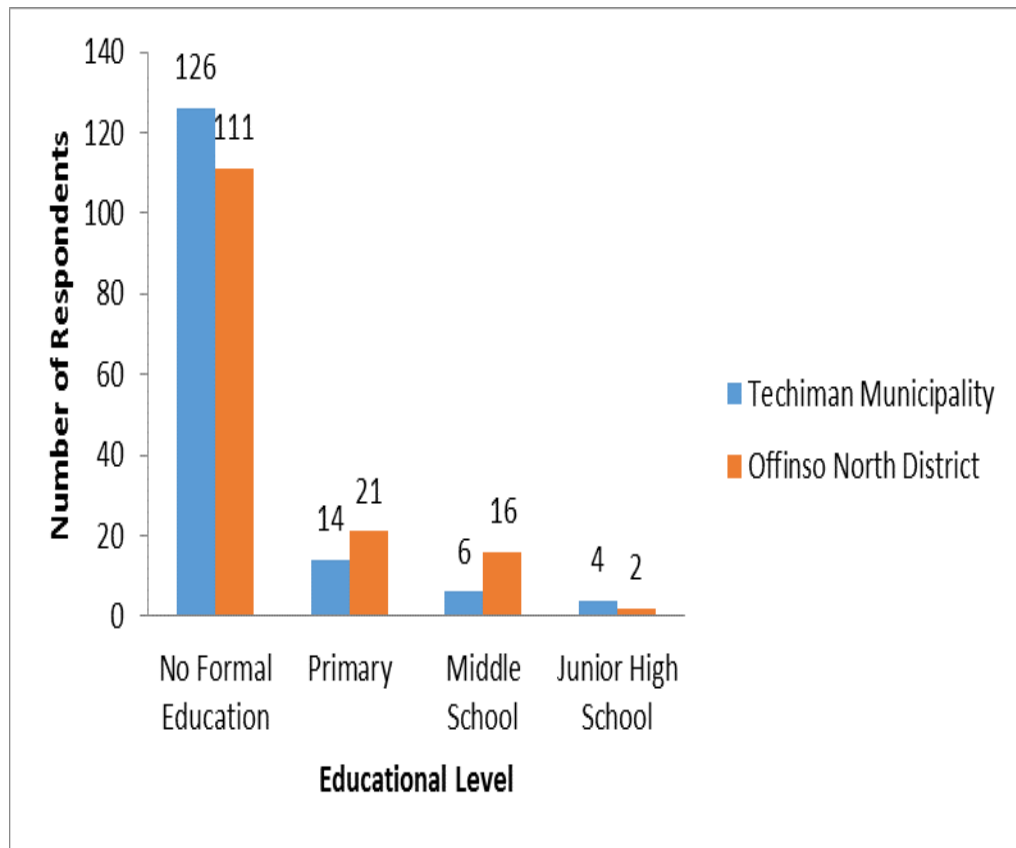


Figure 5. Educational Status of Respondents by Study Area

Source: Survey Data (2011).

A total of 237 respondents from Techiman Municipality and Offinso North District had no formal education. As reported by MoFA (2002), Huffman and Evenson (1980) low formal education is usually a common characteristic of farmers in Ghana. This has negative implications for their maize production

activities as the low education levels limits their active participation in extension training that uses a lot of written material.

As reported by Degefa (2002), education compliments extension advice as, educated people can understand agricultural instructions quite well and be able to apply technical skills imparted to them better than uneducated ones. Also the high illiteracy levels set a limit to the farmer's managerial ability, it could be concluded that, farmers in the study area have not been able to fully exploit their managerial potential which would negatively affect their crop output as well.

Land Holdings of Respondents

Land is a major source of livelihood for smallholder women farmers in Ghana. Table 5 indicates the land holdings of farmers used for maize production. It also depicts an independent t-test of difference between the land-holdings of farmers in both regions.

Table 5: Land Holdings of Respondents by Study Areas and Independent t-test for a Difference in Land Size

Size of Land Holding(acres)	Techiman Frequency N=150	Offinso N. Frequency N=150	t-value	ρ-value
0.1 – 1.0	43	52	1.93	0.155
1.1 – 2.0	77	62		
2.1 – 3.0	19	15		
3.1 – 4.0	10	21		
4.1 – 5.0	0	0		
5.1 – 6.0	0	0		
6.1 - 7.0	1	0		

Mean land holding (Techiman = 1.2; Offinso N. = 1.5); SD = 0.89; SD (Techiman = 0.71; Offinso N. = 0.79)

Source: Survey Data, 2011

The mean score of land holding for respondents from Techiman Municipality was 1.2 acres with a minimum of 0.4 acre and a maximum of 6.5 acres while the mean score of land holding for respondents from Offinso North District was 1.5 acres.

However, the minimum and maximum land sizes for respondents in Offinso North District were 0.8 and 4.0 acres respectively. The small land holdings of respondents imply low maize production levels which results in lower crop yield which further translates into food insecurity if these respondents solely depend on produce from their farm to meet their household food security needs.

As reported by Pennartz and Niehof (1999), the expected effect on household food security is positive because the more the landholding used for farming the higher the output and households are more food secured than those with small farms.

Significant level of land size difference between respondents from Techiman Municipality and Offinso North District was analyzed using an independent t-test. The result was statistically insignificant ($p > 0.05$), indicating that, on the average, there were no differences in the land sizes of respondents from both study areas.

Household Size of Respondents by Marital Status

According to Edriss and Simtowe (2003), household size influences availability of labour especially when farmers depend on family labour. Thus,

the more the number of people in a household, the more the family labour supply is, when all other things are held constant. This affects the amount of hired labour that a farmer uses on his farm to undertake farming activities.

Table 6 below, indicates the household size of respondents by their marital status. The study revealed that, 42.3% of the married respondents from both study areas were within the household size bracket of 3-4. None of the single women had household sizes within the bracket of 5-10.

Although some married women in both regions had household sizes of 5 and above, only 21 and 40 women from Techiman Municipality and Offinso North District were recorded respectively. It could be concluded that, respondents who were married had larger family size.

Table 6: Household Size of Respondent by their Marital Status

Household Size	Techiman		Offinso North D.	
	Married Freq.	Single Freq.	Married Freq.	Single Freq.
1-2	18	48	5	26
3-4	59	4	68	9
5-6	16	0	23	0
7-8	3	0	9	0
9-10	2	0	8	0
Total	98	52	116	17

M= Married; Si = Single; Freq. =Frequency

Source: Survey Data, 2011

The researcher further analyzed the difference in household size between the study districts using the independent t-test and it was significant ($p < 0.05$) as shown in Table 7. This indicates that, respondents in the Offinso North

District have larger household sizes than their counterparts in the Techiman Municipality.

Table 7: Differences in Household Size of Respondents

Household Size	Techiman Frequency n=150	Offinso N. Frequency n=150	t – value	ρ- value
1-2	66	31	3.63	0.003*
3-4	53	77		
5-6	16	23		
7-8	3	9		
9-10	2	8		

Source: Survey Data, 2011

Women in Leadership Positions within FBOs

The researcher investigated the number of respondents occupying leadership position within FBOs. The results revealed that, women were under represented in management positions with only three women out of a total of 300 respondents holding a leadership positions within their FBOs. The women mainly held the treasure position. Regarding decision making within FBOs, the women reported of equal participation in decision making during meetings. When women farmers' access to leadership positions within FBOs are restricted, by law or custom, their access to resources and their ability to make their views known to policy makers and planners are also restricted.

Level of Access to Agricultural Production Resources by Smallholder

Women Farmers Engaged in Maize Production

Farmers' level of access to the eight specific agricultural production resources for their maize production activities was assessed and results presented in Table 8. The overall mean values recorded for the level of access

to the eight specified agricultural production resources were within the categories of “moderate access” (3.39) and “low access” (2.86) for smallholder women maize farmers in Techiman Municipality and Offinso North District respectively.

Table 8: Level of Access to Agricultural Production Resources

Production Resources	n	Techiman Mean Score	SD	Offinso North n	Mean	SD	t-value 3.02	ρ-value 0.001*
Land	150	3.13	1.79	150	3.21	1.90		
Hired labour	150	3.46	0.77	150	3.91	0.71		
Tractor services	35	2.20	0.67	42	2.61	0.89		
Extension service	50	2.09	0.87	48	1.67	0.43		
Fertilizer	78	3.21	0.80	83	2.34	0.45		
Weedicide	69	3.46	0.74	62	2.16	0.93		
Pesticide	42	4.78	0.74	57	2.68	0.88		
Certified seeds	150	4.85	0.63	150	3.30	0.63		
Overall values	-----	3.39	0.89	-----	2.86	0.74		

Scale: Do not access =1, low access = 2, moderate access = 3, and high access = 4; $p < 0.05$ *statistically significant.

Source: Survey Data (2011)

Using a t-test, the differences in mean values of level of access to the eight production resource was statistically significant ($p < 0.05$). The differentials in access to production resources came about probably because Techiman Municipality is a major maize production area therefore inputs and

financial service providers are concentrated in the area and sometimes offer credit facilities to trust worthy farmers.

Another observation that accounted for the difference was that, some maize aggregators prefinanced the production cost of some farmers after which they payback. This suggests that, farmers in the Offinso North District are disadvantaged when it comes to access to the eight specified agricultural production resources. As such the null hypothesis of no difference in the level of access to production resources was rejected in favour of the alternate. Detailed discussions on each of the production resource are presented in the sub-sections below:

Level of Access to Land

Respondent's level of access to land was "moderate" in both Techiman Municipality and Offinso North District with mean values of 3.13 and 3.21 recorded respectively. Land acquisition by respondents in both regions for their production activities were family lands, lease lands, share cropping, gifts and inheritance. However, the predominant tenure system was family lands for both regions. As reported by respondents, these were marginal lands and very small in size. In the case of farmers who hired lands for their productive activities, they complained of high cost. The finding corroborates Duncan (1997) who reported similar observation in a study conducted in the Brong Ahafo, Ashanti, Northern, Upper East and Upper West Regions of Ghana. The study revealed that, smallholder women farmers had access to small land sizes for farming (1-3 acres) which is mainly attributed to the socio-cultural restrictions and lineage systems in Ghana.

For example, for lands which were allocated through traditional means, family heads usually allocate the land to individuals based on their perception of different individual need for land. Because of the perception that women are capable of farming only small plots, they always allocate smaller land to them. This has negative implications for their crop output and household food security (Duncan, 1997).

Level of Access to Tractor Services

Increasing but gradually, smallholder farmers are employing the use of tractor services for traction. About 23% and 28% of the study respondents from Techiman Municipality and Offinso North District respectively used tractor services for their production. Farmers' perception of their access to tractor services was generally in the "low access category". This is because tractor operators in the communities were few. The farmers reported that, during the farming season, the men would hire the tractors, thereby preventing the women from having access to the tractors early during the planting season.

For some farmers, they do not use tractor services because their farms are located in areas that the tractors cannot reach because of trees. Another reason given by some farmers was that their farm sizes are too small. The respondents generally complained of high cost of tractor services. For all the study areas, the cost of ploughing an acre of land was GH¢30 for old plots and GH¢50 for stumping new plots during the 2011 major farming season.

The source of tractor services for these farmers were private commercial tractors. The implication of the low access and usage to tractor services means the labour burden on respondents still persist, thus a factor for preventing them to extend their cultivated plot of land even if they had access to more land.

Level of Access to Extension Services

MoFA's mission is to promote sustainable agriculture and thriving agribusiness through research and technology development, effective extension and other support services to farmers. MoFA is constrained with the number of extension agents providing technical services to farmers. To improve the effectiveness of extension delivery, MoFA has encouraged private sector participation in the funding and delivery of more demand-based and sustainable agricultural extension services as such, a number of NGOs are operating in this area (MoFA, 2002). Of greater concern is the low access to extension services by study respondents with mean values of 2.09 and 1.67 recorded for farmers in Techiman Municipality and Offinso North District respectively. This is likely to impact negatively on their production levels as they miss out on opportunities that can accrue from access to extension education.

For farmers who had access to extension services, their main sources of extension were MoFA and Adventist Development Relief Agency (ADRA). Although the MoFA extension farmer ratio is low, male farmers had greater access to extension services than females. The reasons assigned by respondents for low access to extension services were the few extension farmer contact within the year which was a maximum of three contacts. Some women reported that extension trainings by MoFA or other NGOs coincided with their daily schedules of cooking or household chores hence they were not able to participate in such meetings when available. Other women farmers further expressed that, they were not comfortable approaching male extension agents for fear that, their husbands may complain.

The study findings confirmed the statement reported in MoFA (2010) that, despite considerable spending by MoFA, Ghana has poor extension services with access to extension by farmers very low. The study established that, there were no systematic programme for the extension workers to reach out to farmers on their farms. Their assistance, were obtained upon request to deal with any problem confronting the farmers.

Level of Access to Weedicide

Farmers have to weed their farms to prevent weed competition with crops for nutrients, space, light and to increase their crop yields. Weeds need to be cleared from a field prior to planting a crop and during the growing season for optimal yields to be achieved. Keeping the crop free of weeds for the first third of its life cycle usually assures maximum yield. The study revealed that, the respondents in addition to hand weeding used several weedicides or herbicides to control weeds on their maize farms. For both Regions only 150 farmers used weedicides.

However, the level of access to this input was in the “low” category with mean access level of 2.42 and 2.73 recorded for Techiman Municipality and Offinso North District respectively. The findings confirms the report by Nyariki and Wiggins (1997) that, smallholder farmers in Africa generally have low access to and use less weedicide. Low access to herbicide means the majority of the farmers in the study area used hired and family labour thus do not benefit from the faster and better weed control measure for their production activities accompanied with its potential positive impact of use.

The following weedicides were used by respondents: glyphosate, glycel, paraquat, round up, “kondem”, gramoxine, sarosate, “adwumawora”,

gramoxine select, atrazine, sumphorate. These herbicides as reported by farmers were either applied before planting to remove weeds from the field, or applied to the bare soil at planting for residual control of germinating weed seeds, or directly applied to weeds during the growing season. Respondents who used the herbicide complained of high cost of the input but also reported that, it reduced their workloads to about 3 hours per week.

Research with maize in Nigeria demonstrated that, the use of herbicides reduced the need for labour at the peak period by 29-42% (Oladeebo & Fajuyigbo, 2007). The study further established that, maize yields doubled and production costs fell by 61% in Nigeria when atrazine was used. In Zimbabwe, research with herbicides resulted in yield increases of up to 55% in maize (Adeleke, Adesiyon, Olaniyi, Adelalu & Matanmi, 2008).

Level of Access to Hired Labour

In Ghana, traditionally there has been a strict division of labour by gender in agriculture. This division of labour may be based on crop or task, and both types of division of labour may occur simultaneously (Nyachwo, 2003).

Women may mobilize male labour for some tasks involved in their crop production and men frequently mobilize women's labour for their crop production. These divisions are not static and may change in response to the needs of farmers. Respondent's access to hired labour was in the "moderate access" category for the study area with mean values of 3.46 and 3.91 recorded for respondents in Techiman Municipality and Offinso North District respectively.

The major challenge encountered by respondents in accessing hired labour was the occurrence of labour bottlenecks during the planting and

harvesting seasons as well as the high cost. The study revealed that, for 2011 major farming season, the cost of hiring farm labour per day was GH¢5 for planting and harvesting and GH¢7 for weeding in all the study areas.

Level of Access to Pesticides

Use of pesticides and other disease preventing chemicals can also increase crop yield. However, their access and usage by farmers in Ghana are minimal. The study also revealed “low level of access” to pesticides among farmers in Offinso North District with a mean value of 2.68 recorded. The case was the opposite for farmers in Techiman Municipality with a mean value of 4.78 which was within the “high level access” category. The majority (65%) of the respondents use the pesticide to store the grains after harvesting and not for cultivation. “Akoda Nyame” and Super Athletic were the predominantly used pesticides.

Level of Access to Fertilizer

A critical production constraint in Ghana is the declining of soil fertility due to pressures on cultivable farmlands as well as bad cultural practices. Nonetheless, the number of smallholder farmers who either do not use fertilizer remains quite substantial. Out of a total of 300 respondents, only 161 (54%) applied fertilizer to their crops. Mean value of level of fertilizer access was 3.21 thus within the “moderate access category” for the Techiman Municipality while “low access category” was recorded for the Offinso North District with a mean value of 2.34.

Differences in access level to fertilizer between the study areas could be attributed to the fact that, in Techiman Municipality there were a number of input dealers operating in the area hence respondent’s high level of access to

this input. Reported constraints faced by respondents in accessing the input was high prices of the fertilizer. For example the price of a 50kg bag of compound fertilizer (NPK) was sold at 40 US dollars in year 2011.

The study finding confirms the findings of a study conducted by Sarpong (2010) which revealed that, access to fertilizer in the country by smallholder farmers is limited with high prices contributing to its low usage. This is because smallholder farmers are poorly resourced and unable to invest in soil fertility inputs, particularly mineral fertilizers. The study further established that, fertilizer usage in Ghana is about 5kg/ha which is only half of the rate in sub-Saharan Africa and also far less than in other developing countries. This low application rate is attributed to the high cost of fertilizers. Fertilizers used by the respondents were NPK, urea, ammonia and sulphate of ammonia.

Level of Access to Certified Seeds

Another major determinant of increased crop yield is the use of improved seeds. Level of access to improved seeds was within the “high access” category with a mean value of 4.85 for the Techiman Municipality. Respondents in Offinso North District were however in the “moderate access” category with a mean value of 3.30. Some farmers reported that, they sometimes reserve some of their maize yield as seed maize. Although differences exist in the level of access to improved seeds in both regions, the use of this input is encouraging. Respondents also reported of high cost of improved seeds. Maize varieties grown by respondent were “Obaatanpa” and “Mamaba”.

Yield Levels of Smallholder Women Maize Farmers

The yield levels of respondents for 2010 and 2011 major seasons are presented in Table 9. It could be observed that, for both year 2010 and 2011

major seasons respondents in Techiman Municipality had higher yields than their counterparts in Offinso North District.

Table 9: Yield Levels of Respondents for year 2010 and 2011

Study area	Mean yield per acre (130 kg bag) - 2010	SD	t-value	ρ-value
Techiman	6.50	0.94	4.89	0.566
Offinso	5.70	0.75		
All study areas	6.34	0.97		
	Mean yield per acre (130 kg bag) - 2011			
Techiman	7.20	0.76	5.46	0.871
Offinso	6.27	0.69		
All study areas	6.51	0.88		

Source: Survey Data (2011)

Respondents from the Techiman Municipality recorded a mean yield of 6.50 and 7.20 bags in year 2010 and 2011 respectively. However, the mean yield for all study areas was 6.34 in year 2010. A much lower mean yield of 5.7 and 6.2 were recorded for Offinso North District for year 2010 and 2011 respectively. Mean yield of 6.51 was also recorded for all respondents in year 2011.

The differences in yield among farmers from the two study areas were attributed to differences in the level of access and usage of agricultural production inputs. As reported earlier, the study revealed that, the level of access to land, improved seeds, fertilizer, pesticides and hired labour was within the category of “moderate” and “high” for farmers in Techiman Municipality while that of Offinso North District was in the “low” and “moderate” access categories.

Notably, the overall yield per acre of the study respondents were far lower than achievable maize yield per acre which is about 8 bags. An independent t-test however revealed that, differences in yield observed in both study areas were statistically insignificant ($P < 0.05$) for year 2010 and 2011.

Consequently, the statistical decision was in favour of the null hypothesis that H_0 : There are no differences in the yield levels of smallholder women farmers in Techiman Municipality and Offinso North District engaged in maize production. In western Kenya, lower yields of maize per acre of land have been reported by Santos and Soroko (1999) for women farmers which were mainly attributed to less-secure access to land, lower education levels and low usage of fertilizer.

Moser (2012) also stated that females have less resources and are not likely to purchase productive inputs and to adopt new technologies which improve their crop production.

Percentage of Maize Yield Contributed to their Household

Most rural households in Ghana produce their own food from household farms. In cases where women also own their farms, women contribute a proportion of their farm produce to meet their household food security needs and are responsible for food selection, preparation, care and feeding of the children.

The agricultural productivity of households affects food security directly by increasing the supply of food, particularly for subsistence households, and indirectly by increasing incomes. The researcher was interested in investigating the proportion of maize yield respondents contribute to their household for year 2011 major seasons.

Table 10: Percentage of Maize Yield Respondents Contribute to their**Household**

Percentage of maize yield contributed to the household	Techiman Frequency (%)	Offinso N Frequency (%)	All study areas Frequency (%)
10 -19	24 (16.0)	19 (12.7)	43 (14.3)
20 - 29	42 (16.0)	44 (29.3)	86 (28.7)
30 -39	10 (6.0)	12 (8.0)	22 (7.3)
40 – 49	11(7.3)	0	11 (3.7)
50 -59	5 (3.0)	5(3.0)	10 (3.4)
60-69	0	4(2.7)	4 (1.3)
70-79	6 (4.0)	0	6 (2.0)
80-89	20 (13.4)	28(18.7)	48 (16.0)
90-100	32 (21.4)	38 (25.3)	70 (23.3)
Total	150 (100)	150 (100)	300 (100)

Source: survey Data (2011)

Table 10 shows the percentage of maize respondents contributes to their household food security during year 2011. The study revealed that 86 (28.7%) of the respondents contributed between 20-29% of their maize produced for year 2011 to their households.

The study findings confirms the pivotal role women play in both male-headed and female-headed households in ensuring household food security. Reports of similar maize contributions made by women farmers to their household's in three districts in the Central Region of Ghana have been reported. The study which examined gender roles in ensuring household food security found that, women farmers were found to allocate a greater proportion of their farm produce for household consumption. Thus 34% of their maize

harvest was designated to their household for consumption by the family (Buah et al., 2011).

Household Food Security Status of Respondents

The household food security levels of respondents are presented in Table 11. As indicated in the table, respondents were distributed in all the four food security categories. The study revealed minimal disparities of food security levels existing between respondents from both study areas.

The study revealed that, very few farmers from both study areas (5.7%) were within the “very low food security” category with respondents in Techiman Municipality and Offinso North District recording 5(3.4%) and 12(8%) respectively.

Table 11: Household Food Security Status of Respondents

Food security score category	Techiman F (%)	Offinso N. F (%)	All study areas F (%)
9-11	5 (3.4)	12 (8.0)	17 (5.6)
6-8	25 (16.6)	30 (20.0)	55 (18.4)
3-5	70 (46.6)	68(45.4)	138 (46.0)
0-2	50 (33.4)	40 (26.6)	90 (30.0)
Total	150 (100)	150 (100)	300 (100)

Scale: 9-11(very low food security); 6-8 (low food security); 3-5 (moderate food security) and 0-2 (High food security); F=Frequency.

Source: Survey Data (2011)

This implies that, these households reduced the quality, variety and desirability of their diets, but the quantity of food intake and the normal eating pattern were not substantially disrupted. The majority of the respondents from Techiman Municipality (46.6%) and the Offinso North District (45.4%) were within the category of “moderate food security” making a total of (46.0%) for

both study areas. Thus households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced. For respondents within the “high food security” category a total of 90 respondents (30.0%) was recorded and reported of no indication of food access problems or limitations.

This finding confirms the study results of Strebelle and Nyamekye (2011) that, while Ghana can be classified as generally food secure, pockets of food-insecure population exist in some regions because of limited access to production resources and lack of alternate livelihood opportunities.

Effect of Access to Production Resources on the Household Food Security

Status of Respondents

The study investigated the relationship between the categorical variables access to production resource and the household food security status of respondents by use of crossbreak tables and results presented in Table 12. For farmers who had “low access” to production resources only 10 (3%) from both study areas were within the “high” household food security category. With respect to respondents who had “high access” to production resources from both study areas a total of 6, 11, 65 and 24 respondents were in the “high”, “moderate”, “low” and “very low” household food security categories respectively.

The findings of the study confirms the study results of Jamison and Lau (1982) that, access to production resources results in increased crop yield per acre which translates into improved household food security for 95% of rural households.

Table 12: Access to Production Resource and Household Food Security**Status of Respondents**

Food security status	Low access to production resources		Moderate access to production resources		High access to production resources	
	T	O	T	O	T	O
0-2	4	6	1	6	0	6
3-5	3	0	4	5	6	5
6-8	0	0	28	23	42	23
9-11	0	0	26	0	24	0
Total	7	6	59	34	72	34

T- Techiman Municipality; O – Offinso North District

Source: Survey Data (2011).

A positive significant relationship exist between access to production resources and household food security of farmers as revealed by a Chi-Square test conducted with results in Table 13 implying that, the null hypothesis of the study was rejected in favour of the alternate that, there is a positive relationship between level of access to production resources and the food security status of smallholder maize farmers in Techiman Municipality and Offinso North District of Ghana.

Table 13: Chi-Square Test for Association between Access to Production Resources and Household Food Security Status of Respondents

Study areas	Chi-Square test value	Critical values for Chi-Square
Techiman	26.57	12.59*
Offinso N.	32.09	

P<0.05 df=6

Source: Survey Data (2011)

This calls for a strong need to ameliorate production resource constraints of women farmers in the study areas to boost their maize yield level which have the potential to improve upon their household food security.

Age of Respondents by Household Food Security Status

Farmers acquire experience and knowledge through devoting their time on farm activities, therefore older age means better experience, better coping strategies in the case of adverse climatic conditions and better food security.

This test was undertaken to see whether there is a significant mean difference between the ages of the “food insecure” and the “food secured” among sampled respondents. The four food security levels were collapsed into only two levels thus “very low” and “low” food security levels were combined as “food insecure” while “moderate” and “high” food security levels were combined as “food secured”.

Table 14: Age of Respondents and Household Food Security Status

Age of respondents (all study areas)	Food insecure (n=228)	Food secured (n=72)	t- value	p- value
Mean	43.57	38.31	2.442	0.016*
SD	12.60	12.18		

p<0.05 *statistically significant

Source: Survey Data (2011)

The results in Table 14 shows that, the mean of respondents who reported that their households were food insecure and foods secured were 43.57 and 38.31 years with standard deviations of 12.60 and 12.18 respectively. The independent t-test shows there was a significant difference between the mean ages of the “food insecure” and the “food secured” respondents. This results

indicates that, the food secured households are relatively younger than the food insecure households.

Farm Size and Household Food Security Status of Respondents

The presence of sufficient farm land in the household determines the food security status of a household and also encourages them to use new agricultural technologies such as fertilizer, pesticides etc. The analysis was carried out to see whether there is a significant mean farmland size difference between the “food insecure” and the “food secured” respondents.

Table 15: Farm size and Household Food Security Status of Respondents

Farm sizes (Acres)	Food insecure (n=228)	Food secured (n=72)	t- value	p- value
Mean	2.4	2.9	-1.743	0.084*
SD	1.4	1.9		

p<0.05 * statistically significant

Source: Survey Data, 2011

Table 15 indicates that, the mean farmland size difference between the food insecure and the food secured respondents were 2.4 and 2.9 acres with standard deviation of 1.4 and 1.9 acres respectively. The independent t-test showed that, there was a significant mean difference in farm sizes between the food secured and the food insecure respondents at 5% significant level. The “food secured” respondents had a relatively larger land sizes than the “food insecure” respondents.

Household Food Security Coping Strategies Adopted by Respondents

Although the majority of rural households derive their food from their own production, yet during times of food scarcity most households adopt several strategies to meet their food security needs. Table 16 presents coping strategies

adopted by respondents in the study areas to meet their household food security needs.

Table 16: Coping Strategies Adopted by Respondents

Coping strategies	Techiman F (%)	Offinso N. F (%)	All study areas F (%)
Production and sale of crops	150 (75.5)	48 (24.5)	198 (100)
Reduction in meals	78 (44.3)	98 (55.7)	176 (100)
Engagement in petty trading	69 (47.3)	77 (52.7)	146 (100)
Engagement in on-farm paid job	58 (57.4)	43 (42.6)	101 (100)
Engagement in agro processing	32 (40.0)	48 (60.0)	80 (100)
Sale of livestock reared	31 (57.0)	23 (42.5)	54 (100)
Sale of forest products	28 (59.5)	19 (40.5)	47 (100)
Donations	21 (70.0)	9 (30.0)	30 (100)
Remittance from children	18 (62.0)	11 (38.0)	29 (100)
Engagement in non-farm paid job	8 (72.7)	3 (27.3)	11 (100)

Source: Survey Data (2011)

The production and sale of vegetables such as tomatoes, pepper, garden eggs okro and other food crops such as cassava, plantain, yam, cocoyam etc were the predominant coping strategy adopted by farmers in both study areas.

A total of 198 respondents from the two study areas reported of using this strategy.

This findings corroborate with the reports by Ezumah and Domenico (1996), that in Nigeria, rural women contribute to their household food security by growing food crops for consumption and for sale to earn income. Education provides opportunity for non-agricultural paid jobs. Since low education levels were found among the study respondents, only 11 respondents from the study areas expressed their engagement in non-farm paid jobs.

Other coping strategies adopted by respondents were their engagement in agro processing (cassava, palm nuts, groundnuts, cassava powder, corn etc); engagements in petty trading; sale of forest products such as cane, snails, herbs, firewood, mushrooms etc; remittance from children; reduction in the number of meals per day; sale of livestock reared and engagement in on-farm paid jobs.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

In this chapter, a summary and conclusions drawn from the study are presented. Recommendations have also been put forward for actions by specific institutions. Finally, further research is suggested.

Summary

In Ghana, agriculture contributes about 40% to the GDP, provides the raw material base for industrial activities and a source of livelihood to a significant segment of the population, particularly smallholder farmers. In Ghana access to agricultural production resources by farmers is a problem and threatens household food security (MoFA, 2005). The study was undertaken to investigate if access to agricultural production resources by smallholder women farmers had effect on their household food security.

The following specific objectives were set:

1. examine the socio-demographic characteristics of respondents;
2. determine the level of access of agricultural production resources by smallholder women farmers in maize production in terms of land, hired labour, tractor services, extension services, fertilizer, weedicide, certified seeds, pesticides:
3. determine the yield levels of smallholder women farmers in maize production.
4. investigate the percentage of the maize yield the women farmers contribute to their households.
5. determine the food security status of smallholder women farmers in

the Techiman Municipality and Offinso North District of Ghana.

6. examine the relationship between the level of access to production resources and the food security status of the smallholder women farmers in the Techiman Municipality and Offinso North District of Ghana.

7. investigate the coping strategies adopted by smallholder women farmers in meeting their household food security.

To address the objectives, relevant research questions and hypotheses were formulated.

The following hypotheses were tested:

1. H_0 : There are no differences in the level of access to agricultural production resources by smallholder women farmers engaged in maize production in Techiman Municipality and Offinso North District engaged in maize production.

H_a : There are differences in the level of access to agricultural production resources by smallholder women farmers in Techiman Municipality and Offinso North District engaged in maize production.

2. H_0 : There are no differences in the yield levels of the smallholder women farmers in Techiman Municipality and Offinso North District engaged in maize production.

H_a : There are differences in the yield levels of smallholder women farmers in Techiman Municipality and Offinso North District engaged in maize production.

3. H_a : There is no relationship between level of access to production resources and the food security status of smallholder women

farmers engaged in maize production in the study areas.

H₀: There is a relationship between level of access to production resources and the food security status of smallholder women farmers engaged in maize production in the study areas.

Where: H₀ denotes the null hypothesis and H_a alternate hypothesis.

The study was a descriptive correlational research which investigated the relationship between access to agricultural production resources and household food security. The study was conducted in a total of nine communities from the Techiman Municipality, Brong Ahafo Region and Offinso North District, Ashanti Region of Ghana from November to December, 2011. The respondents of the study were 300 women farmers who engaged in maize production and were members of FBOs. An interview schedule was used for data collection and for the analysis, SPSS Version 15 was used. The findings of the study are summarized in the subsections below.

Characteristics of Respondents

Respondents of the study were 300 smallholder women farmers in the Techiman Municipality and Offinso North Districts of Ghana engaged in maize production. The mean age was 42 years with a standard deviation of 8.4 indicating that the majority of the farmers were experienced in maize production. An independent t-test of difference in ages of farmers in both study areas was statistically insignificant ($p > 0.05$). With respect to marital status of respondents, a total of 214 were married with a total of 86 respondents being single.

The highest educational attainment of respondents' was the JSS category recording 79.3% from both study areas. A t-test of independence also

showed an insignificant educational level difference between farmers in Techiman Municipality and Offinso North District ($p > 0.05$). Regarding land holdings of respondents, mean land holdings for study respondents was 1.3 acres. The small land holding of respondents implies that, smaller acreages of maize were cultivated. An independent t-test conducted was statistically insignificant implying that, on the average, there were no differences in the landholdings of respondents in both study areas. The modal household size was 3 to 4 for both study areas. None of the single respondent's had household sizes above 5. This indicates that, the married women had larger family size and would tend to have a variety of labour capacity. An independent t-test on household size of respondents in both study areas was statistically significant ($p < 0.05$) indicating that, respondents in Offinso North District have larger household sizes than their counterparts in Techiman Municipality.

The involvement of women in decision making within FBO leadership was also assessed. Only one percent of the respondents occupied a leadership position. Implying that, it is likely that the production needs of these women may not be addressed by the FBO leadership.

Respondents Level of Access to Agricultural Production Resources

The agricultural production resource variables of the study were: land, hired labour, tractor services, extension services, fertilizer, weedicide, pesticides and certified seeds: The mean value of these variables were determined by use of a likert-type scale of 1-4 with 1 as “do not access production resource” and 4 as “high access to production resource” and their means determined using descriptive statistics. The overall mean values of level of access to all the eight agricultural production resources were within the

“moderate access category” (3.39) and “low category” (2.86) for farmers in the Techiman Municipality and the Offinso North District respectively.

An independent t-test conducted showed a statistically significant difference in level of access to production resources between farmers in Techiman Municipality and Offinso North District ($p < 0.05$). As such the null hypothesis of “there are no differences in the level of access to agricultural production resources by smallholder women farmers in Techiman Municipality and Offinso North District in Ghana engaged in maize production” was rejected in favour of the alternate.

The differentials in access to production resources observed was because in Techiman Municipality, there were a number of agro input shops located there as such farmers had easy access to production inputs. The respondents from Techiman Municipality also established that, some maize aggregators pre-financed their maize production cost after which they paid back after harvest. However, farmers in the Offinso North District did not report of such agreements with maize aggregators.

Yield Levels of Smallholder Women Farmers

Yield of respondents in the year 2010 and 2011 major seasons were higher with mean values of 6.50 and 7.20 bags recorded for farmers in the Techiman Municipality. On the other hand, farmers in the Offinso North District had much lower yield with mean yield values of 5.7 and 6.2 for year 2010 and 2011 major seasons respectively. The differentials in yield of farmers in both study areas, was mainly attributed to the differences in the level of access and usage to production inputs.

An independent t-test however revealed that, differences in yield of farmers in both study areas were statistically insignificant ($P < 0.05$). Consequently, the statistical decision was in favour of the null hypothesis that H_0 : There are no differences in the yield levels of smallholder women farmers in Techiman Municipality and Offinso North District engaged in maize production.

Contribution of Maize Yield to the Household

Investigating the percentage of maize yield respondents contribute to meet their household food security, the study revealed that, for both study areas, the modal percentage contribution made by 86 out of 300 farmers were 20-29%.

Household Food Security Status of Respondents

The study revealed that, respondents' household food security status lied on a continuum from "very low" to "high" food security status. For all respondents in both regions, only 2.3% of the respondents were within the "very low food security" status. "Moderate food security" status were recorded for a total of 138 (46%) respondents from both regions thus forming the majority. For "high food security" categories, a total of 60% were recorded for all study areas with 50 (33.4%) and 40 (26.6%) farmers from Techiman Municipality and Offinso North District respectively.

Access to Production Resources and Household Food Security of Respondents

A crossbreak table was used to establish the relationship between the categorical variables level of access to production resources and household food security status of respondents. The study revealed that, high access to

production resources by farmers significantly result in high household food security of farmers.

Coping Strategies Adopted by Respondents in Meeting their Household

Food Security

The respondents were engaged in a number of strategies to meet their household food security needs. The production and sale of vegetables such as tomatoes, pepper, garden eggs okro and other food crops such as cassava, plantain, yam, cocoyam etc was however the predominant coping strategy adopted by farmers in both study areas.

Other coping strategies adopted by the respondents were their engagement in agro processing of cassava, palm nuts, groundnuts, cassava powder, and corn; engagements in petty trading; sale of forest products such as cane, snails, herbs, firewood and mushrooms; remittance from children; reduction in the number of meals per day; sale of livestock reared; engagement in on- farm paid jobs and non-farm paid jobs.

Conclusions

The issue of food security is of national concern and diverse number of programmes and policy interventions are been undertaken by Government and Development partners to address the situation in Ghana. Given the essential role smallholder women farmers play in ensuring household food security, this study investigated access to agricultural production resources on the household food security of smallholder women maize farmers in the Techiman Municipality and Offinso North District of Ghana.

The research therefore attempted to find answers to the following questions: What are the socio-demographic characteristics of smallholder

women farmers in Offinso North District and Techiman Municipality engaged in maize production?; What are the levels of access to agricultural production resources by smallholder women farmers in Offinso North District and Techiman Municipality engaged in maize production?; What are the yield levels of smallholder women farmers in the Offinso North District and Techiman Municipality engaged in maize production?; What percentages of maize yield are contributed by smallholder women farmers to their household to meet their household food security needs?; What are the household food security status of the smallholder women maize farmers in Offinso North District and Techiman Municipality of Ghana?; Does access to agricultural production resources have effect on the household food security levels of smallholder women maize farmers in the Offinso North District and Techiman Municipality?; and finally, what are the coping strategies adopted by smallholder women farmers in Offinso North District and Techiman Municipality to meet their household food security needs?.

I set out to examine this issue in the Offinso North District and Techiman Municipality of Ghana because of the high maize production activity in the area. The first conclusion drawn from this study, in terms of socio-demographic characteristics are that, the majority of the women farmers in the study area were experienced in their maize production activities, and may be stronger per the mean age of 42 years observed. Majority of the respondents were married and had larger household size than the single women farmers. A low educational level of the women farmers discovered also hindered their ability to fully exploit their managerial potential in maize production. Of particular relevance is the issue of access to small land holding by the women

farmers which significantly affects their maize yields. The women farmers were under represented in management positions and this could negatively affect their ability to make their views known to their FBO leadership and policy makers.

The second conclusion drawn from this study is that smallholder women farmers in the Offinso North District and Techiman Municipality had “low access” and “moderate access” to the eight agricultural production resources respectively. Thus, farmers in Offinso North District are disadvantaged in their access to the eight production resources as compared to their counterparts in Techiman Municipality. This negatively affected their maize yields and contributed to the low maize yield per acre observed which were lower than the achievable yield per acre.

Thirdly, the low yield observed were also as a result of the “moderate access” to land, extension service, tractor services and weedicide by the women farmers. This impacted negatively on their maize production activities as they will miss out on opportunities that can accrue from access to extension education. This also implies that the labour burden of these smallholder women maize farmers still persist as they do not use faster, better and mechanized land preparation and weeding methods.

Another conclusion drawn from the study were that, women farmers in the study areas contributed a percentage of their maize yield for household consumption with a modal percentage bracket of 20-29% meaning that they play a vital role in ensuring their household food security.

The fifth conclusion drawn from the study was the minimal disparity observed between the household food security levels of respondents in the

Techiman Municipality and Offinso North District. The differential in household food security levels observed were as a result of differences in the level of access to the eight agricultural production resources. Land holdings of the women farmers also determined their food security level as food secured women in the study areas had larger land sizes while the food insecure households had smaller land holdings.

The study further concludes that, a positive significant relationship exist between access to production resources and household food security of the smallholder women farmers in the study area.

Finally, the smallholder women maize farmers in the Offinso North District and Techiman Municipality in their quest to meet their household food security needs engage in alternative coping strategies. The most predominant coping strategy was the sale of vegetables such as tomatoes, pepper, garden eggs okro and other food crops such as cassava, plantain, yam, cocoyam etc. The low level of education among the respondents however limited their ability to engage in non-farm paid jobs as only 3.7% of the total respondents engaged in non-farm paid jobs.

Recommendations

1. Local Government, Development Partners and Financial Institutions working in the Offinso North and Techiman Municipality should support women farmers engaged in maize production with the following agricultural production resources: tractor services, fertilizer, weedicides, pesticides and improved seeds to boost their production activities. Such support could be input credit or cash credit to enable the

farmers procure the needed production resources for their maize production.

2. Women access to small landholding in Techiman Municipality and Offinso North Districts should be addressed. Development partners and NGOs working in the study areas should sensitize Opinion Leaders, Chief and Family Heads to put an end to the discriminatory legislation, traditional norms and culture that prevent women from having access to large landholdings for their production activities.
3. Leaders of Farmers Based Organisations in the Offinso North and Techiman District, should encourage women to take up leadership positions. This will encourage them to take part in decisions that affects their production activities and access to production resources.
4. The Department of Agriculture in the study areas should make a request for more extension officers to enhance farmers' access to extension service. This could be done through the Offinso District Assembly and Techiman Municipal Assembly to the Local Government Service Secretariat in Accra.
5. The Offinso North and Techiman Municipal Assembly and NGOs working in these districts should establish non formal education centres to train women farmers to be able to read and write as majority of the respondent had no formal education.
6. The women farmers should form viable groups and approach MoFA District Offices in Techiman Municipality and the Offinso North District to assist them access tractor services from private tractor operators.

7. Smallholder women farmers in the study area engage in agro processing as part of their coping strategies in ensuring their household food security. As such, NGOs working in the Techiman Municipality and Offinso North District should come up with projects that would provide the farmers with the needed processing equipment.

Further Research

Researchers in Ghana should commission a nationwide study to examine “smallholder women farmers access to agricultural production resources” to assist policy makers to understand the real production resources needs of women farmers to ensure that development of programmes and projects address their needs.

REFERENCES

- Adams, J. & Bumb, B. (1979). Determinants of agricultural productivity in Rajasthan, India: The impact of inputs, technology and context on land productivity. *Economic Development and Cultural Change*, 27 (4), 705-722.
- Adeleke, O. A., Adesiyan, O. I., Olaniyi, O. A., Adelalu, K. O. & Matanmi, H. M. (2008). Gender differentials in the productivity of cereal crop farmers: A case study of maize farmers in Oluyole local government area of Oyo State. *Agricultural Journal*, 3 (3), 193-198.
- Ahearn, M. J., Ball, E., & Nehring, R. (1998). *Agricultural productivity in the United States*. Agricultural Information Bulletin (740). Washington DC: US. Department of Agriculture.
- Alderman, H. & Higgins, P. (1992). *Food and nutritional adequacy in Ghana* policy paper (27). Ithaca, NY: Cornell Food and Nutrition Policy Project.

- Alderman, H. (2005). Linkages between poverty reduction strategies and child nutrition: An Asian perspective. *Economic and Political Weekly*, 40 (46), 4837-4842.
- Allendorf, K. (2007). Do women's land rights promote empowerment and child health in Nepal? *World Development*, 35 (11), 1975-1988.
- Al-Sultan, F. H. (2000). IFAD's experiences from two decades of poverty alleviation in rural Africa. In: K. J. Havnevik (Ed.), *The institutional context of poverty eradication in rural Africa (pp18-24)*. Uppsala: Nordiska Afrikainstitutet.
- Amedahe, F. K. (2002). *Fundamentals of educational research methods* University of Cape Coast Press: Cape Coast.
- Asenso-Okyere, W.K. & Davis, K. (2009). Willingness to pay for health insurance in developing countries: A pilot study of the information sector of Ghana using contingent evaluation. *Health Policy* 42 (2) 223-237.
- Asenso-Okyere, K., Chiang, C., Thangata, P., Andam, K. & Mekonnen, D. A. (2011). Understanding the interaction between farm labor productivity, and health and nutrition: A survey of the evidence. *Journal of Development and Agricultural Economics*, 3 (3), 80–90.
- Ashley, C. and D. Carney (1999). *Sustainable livelihoods: lessons from early experience*. London, Russell Press Ltd., Nottingham.
- Barrett, C. B. (2002). Food security and food assistance programs. In: G. Rausser & B. Gardner (Eds.), *Handbook of agricultural*

- economics*. (pp 2103-2190). Amsterdam: Elsevier Science.
- Bardhan, P., & Udry, C. (1999). *Development microeconomics*. Oxford: Oxford University Press.
- Becker, G. S. (1965). A theory of allocation of time. *Economic Journal*, 75, 493-517.
- Bernard, T., Collion, M.H., de Janvry, A., Rondot, P., & Sadoulet, E. (2008). Do Village organizations make a difference in African rural development? A study for Senegal and Burkina Faso. *World Development*, 36 (11), 2188–2204.
- Bickel, G., Nord, M., Price, C., Hamilton, W. & Cook, J. (2000). *Guide to measuring household food security*. Alexandria: US Department of Agriculture, Food and Nutrition Service.
- Bliss, C. J., & Stern, N. H. (1982). *Palanpur: The Economy of an Indian village*. New Delhi and New York: Oxford University Press.
- Bonnard, P. (1995). *Increasing the nutritional impacts of agricultural interventions*. Paper presented at the Horn of Africa Workshop on Agricultural Policy, Resource Access and Human Nutrition. Addis Ababa.
- Bouis, H. (2003). Commercial vegetable and polyculture fish Production in Bangladesh: Impacts on income, food consumption and nutrition. In: A.R. Quisumbing (Ed), *Household and decisions, gender and development: A synthesis of recent research* (pp. 73-77). Baltimore, MD: The John Hopkins University Press.

- Boyd, C., & Slaymaker, T. (2000). Re-examining the “more people less erosion” hypothesis: Special case or wider trend. *Natural Resource Perspective*, 63, 1-6.
- Boyd, C., & Turner, C. (2000). *The contribution of soil and water conservation to sustainable livelihoods in the semi-arid areas of Sub-Saharan Africa* (Agrekon Network, Paper No. 102 pp. 15-17).
- Bryceson, D.F. (1980). The polarization of women in Tanzania. *Review of African Political Economy* 17, 4-27.
- Buah, A., Bempah, C. K., Enimil, E., Blewu, B., & Agyei-Martey, G. (2011). Residues of organochlorine pesticides in vegetables marketed in Greater Accra Region of Ghana. *Food Control*, 25(2), 537-542.
- Bumb, B. L., Teboh, J. F., Atta, J. K. & Asenso-Okyere, W. K. (1994). *Ghana policy: Environment and fertilizer sector development*. Alabama: IFDC.
- Cain, M., Khanam, S.K. & Nahar, S. (1979). Class, patriarchy and the structure of women’s work in rural Bangladesh. *Population and Development Review*, 5 (3), 405-438.
- Campilan, D. (1998). Preface: Livelihood issues in root crop research and development. In: *Sustainable livelihood for rural households: Contribution from root crop agriculture* (pp. 9-12). Los Banos, Laguna: UPWARD.
- Chambers, R. (1989). Editorial introduction: Vulnerability, coping and

policy. *IDS Bulletin*, 20 (2), 1-7.

- Chambers, R., & Conway, R. (1992). Sustainable rural livelihoods: Practical concepts for the 21st century. *IDS Discussions Paper* (296). Sussex: Institute of Development Studies.
- Chapman, R., & Tripp, R. (2004). Background paper on rural livelihood diversity and agriculture. In *AgREN electronic conference on the implications of rural livelihood diversity for pro-poor agricultural initiatives*. London: Overseas Development Institute of Agricultural Research and Extension Network.
- Chopak, C. J. (1986). Family income sources and food security. In: G. Mudimu & R. H. Bernstein (Eds.), *Household and national food security in Southern Africa* (pp 22-24). Harare: Department of Agricultural Economics and Extension, University of Zimbabwe.
- Clark, G. (1985). Fighting the African food crisis: Women food farmers and food workers. *UNIFEM Occasional Paper* No.1. United Nations Development Fund for Women.
- Clay, E. (2002). *Food security concepts and measurement*. Paper for FAO expert consultation on trade and food security: Conceptualizing the linkages. Rome: FAO.
- Clay, D.C., & Schwarzweller, H.K. (1991). Introduction: Rethinking household Strategies. In: C.D. Clay and H.K. Schwarzweller (Eds), *Research in rural sociology and development: A research manual 5* (pp.1-11). London: J.A.I. Press Inc.
- Coates, J., Swindale, A., & Bilinsky, P. (2007). *Household food*

insecurity access scale (HFIAS) for measurement of food access: indicator guide. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.

Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2011).

Household food security in the United States in 2010. United States Department of Agriculture. Washington DC: USDA
Retrieved: June 10, 2011, from <http://www.ers.usda.gov/Publications/ERR125/>.

Corbett, G. (1988). Off-farm employment in the development of rural Asia. *Economic Journal*, 1, 198-199.

Dasgupta, P. (1993). *An inquiry into well-being and destitution*. Oxford: Clarendon Press.

Degefa, T. (2002). *Household Seasonal Food Insecurity in Oromiya Zone, Ethiopia: Causes*. Retrieved August 20, 2007, from <http://www.ossrea.net/ssrr/no26/no26-01.htm>.

de Janvry, A., & Sadoulet, E. (2006). *How effective is a demand driven approach to rural development beyond agriculture?: The promise of the rural economy for growth and poverty reduction*. Rome: Food and Agriculture Organization of the United Nations.

Dessalegh, R. (1991). *Famine and survival strategies: A case study from Northeast Ethiopia* Uppsala: Nordiska Afrikainstitutet.

Debebe H. (1995). Food security: A brief review of concepts and indicators.

- In: D. Multa, A. Wolday, E. Simeon & Z. Tesfaye (Eds.), *Food security, nutrition and poverty alleviation in Ethiopia: Problems and prospects* (pp.1-18). Addis Ababa: Agricultural Economics society of Ethiopia.
- Devereux, S. & Maxwell, S. (2001). *Food security in Sub-Saharan Africa*. Johannesburg, South Africa: University of Natal Press.
- Devereux, S. (1993). Goats before ploughs: Dilemmas of household response sequencing during food shortages. *Institute for Development Studies Bulletin*, 24, 29-43.
- Dietz, T. (2000). *Poverty and land degradation*. Paper at the conference on World poverty: A challenge for the private sector. October 3-4, 2000, Amsterdam.
- Diriba, G. (1995). *Economy at the crossroad: Famine and food security in rural Ethiopia*. Addis Ababa: Care International in Ethiopia.
- Dorward, A., Chirwa, E., Boughton, D., Crawford, E., Jayne, T., Slater, R., Kelly, V., & Tsoka, M. (2008). *Towards 'smart' subsidies in agriculture. Lessons from recent experience in Malawi*. London: Overseas Development Institute.
- Doss, C. & Morris, M. (2001). How does gender affect the adoption of agricultural innovations. The case of improved maize technology in Ghana. *Agricultural Economics*, 25 (1), 27–39.
- Downing, T. E. (1996). *Climate Change and World Food Security: Proceedings of the NATO advanced research workshop, held in Oxford U.K. July 11 - 15, 1993*. Berlin etc., Springer-Verlag.
- Duncan, B. A. (1997). *Women in agriculture in Ghana*. Accra: Frederick Ebert Foundation.

- Edriss, A. K. & Simtowe, F. (2003). *The dynamics of groundnut production, efficiency, profitability and adoption of technology in Sub-Saharan Africa: The Malawi case*. Las Vegas: International Publishers and Press.
- Ellis, F. (1992b). *Agricultural Policies in Developing Countries*. Cambridge: Cambridge University Press.
- Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*. Oxford and New York: Oxford University Press.
- Ellis, F., & Mdoe, N. (2003). Livelihoods and rural poverty reduction in Tanzania. *World Development*, 31 (8), 1367–1384.
- Ezumah, N. & Domenico, C.M. (1996). Enhancing the role of women in crop production: A case study of Igbo women in Nigeria. *World Development*, 23 (10), 1131-1744.
- FAO (1993). *Agricultural extension and women farm workers in the 1980s*. Rome: FAO.
- FAO (1996). *Rome declaration on world food security and World Food Summit plan of Action*. Rome: World Food Summit.
- FAO (2001). *Soil carbon sequestration for improved land management*. *World Soil Resources Reports*, (96), Food and Agricultural Organization: Rome, Italy.
- FAO (2003a). *Trade reforms and food security: Conceptualizing the linkages*. Rome: FAO.
- FAO (2003b). *Special programme for food security expands in Ethiopia*. Addis Ababa: FAO.
- FAO (2004). *The state of food insecurity in the world*. Rome: FAO.

- FAO (2009). *Gender equality in agriculture and rural development*. Rome: Food and Agriculture Organization.
- FAO (2010). *State of food insecurity in the world*. Rome: FAO.
- Faridi, R., & Wadood, S.N. (2010). *An Econometric analysis of household food security in Bangladesh*. In *The Bangladesh Development Studies*, No. 3.
- Farinde, A.J., Jibowo, A.A. & Odejide, S.A. (1993). Extension activities of women-in-agriculture: Agents for enhancing food security among women farmers in Osun State. *Proceedings of the Second Annual Conference of the Agriculture Extension Society of Nigeria: Issues and perspectives in food security in the present and future* (pp. 224-262). Ilorin: Agricultural Extension Society of Nigeria.
- Fassil, G. (2005). *Enough with famines in Ethiopia: A clarion call*. Addis Ababa: Commercial Printing Enterprise.
- Fosu, K.Y., & Nico, H. (2011). *Food Security and Nutrition: Implication of policy reforms with a case study of Ghana*. <http://www.uclouvain.be/cps/ucl/doc/ecru/documents/TF5M4D08.pdf>.
- Fraenkel, J. R., & Wallen, N. E. (2003). *How to design and evaluate research in education*. Boston: McGraw Hill.
- Frankenberger, T.R. (1992). Indicators and data collection methods for assessing household food security. In: M. Simon & T. R. Frankeberger (Eds.), *Household food security: Concepts, indicators, measurements* (pp 74-134). Rome & New York: IFAD & UNICEF.
- Frankenberger, T.R., & McCaston, M.K. (2001). *The household livelihood security concept*. Retrieved: March 1, 2002 from <http://www.fao.org/>

docrep/x0051t/x0051t05.htm.

- Frongillo, E. A. Jr. (1999). Validation of measures of food insecurity and hunger. *Journal of Nutrition*, 129, 506–509.
- Garrett, J. L. & Ruel, M. T. (1999). Are determinants of rural and urban food security and nutritional status different? Some insight from Mozambique. *World Development* 27 (11), 1959 – 1975.
- Gilbert, R. A., Sakala, W. D. & Benson, T. D. (2002). Gender analysis of a nationwide cropping system trial survey in Malawi. *African Studies Quarterly*, 6 (2), 223–243.
- Gray, L., & Kevane, M. (1999). Diminished access, diverted exclusion: Women and land tenure in sub-Saharan Africa. *African Studies Review*, 42 (02), 15-39.
- Hallman, K. (2000). Mother-father resource control, marriage payments, and girl-boy health in rural Bangladesh. *FCND Discussion Paper* (93). Washington DC: International Food Policy Research Institute.
- Hamelin, A. M., Habicht, J. P., & Beaudry, M. (1999). Food insecurity: Consequences for the household and broader social implications. *Journal of Nutrition*, 129 (2), 525S–528S.
- Healey, P. (2004). The treatment of space and place in the new strategic spatial planning in Europe. *International journal of urban and regional research*, 28 (1), 45-67.
- Hoddinott, J. (1999). *Choosing outcome indicators of household food security*. Washington, DC: International Food Policy Research Institute.
- Hoisington, A., Schultz, J.A., & Butkus, S. (2002). Coping strategies and

- nutrition education needs among food pantry users. *Journal of Nutrition Education and Behavior*, 34, 326-333.
- Holden, S., Shiferaw, B., & Pender, J. (2001). Market imperfections and land productivity in the Ethiopian highlands. *Journal of Agricultural Economics*, 52 (3), 53-70.
- Hopkins, R. F. (1996). *Food security, policy options and the evolution of state responsibility*, in F. L. Tullis, and W. L. Hollist, (Eds), *Food, the State and International Political Economy: Delemas of developing countries*, University of Nebraska Press, Lincoln and London.
- Huffman, W. E. & Evenson, E. (1980). *Science for agriculture*. Ames: Lower State University Press.
- Hussein, K. (2004). Farm system and household economy as frameworks for prioritising and appraising technical research: A critical appraisal of current approaches. In M. Haswell & D. Hunt (Eds.), *Households in emerging societies: Technology and change in Sub-Saharan Africa* (pp 49-76). Oxford: Berg.
- Huq, H. (2000). *People's Perception: Exploring contestation, counter-development, and rural livelihoods cases from Muktinagar, Bangladesh*. Unpublished doctoral thesis, Wageningen University, Wageningen, The Netherlands.
- Ibrahim, H., & Bello, M. (2009). Food security and resource allocation among farming households in North Central Nigeria. *Pakistan Journal of Nutrition*, 8 (8), 1235–1239.
- Iram, U. & Butt, M. S. (2004). Determinants of household food security: An

- empirical analysis for Pakistan. *International Journal of Social Economics* 31(8), 735-766.
- Jamison, D. T., & Lau, L. J. (1982). *Farmer education and farmer efficiency*. Baltimore, MD: Johns Hopkins University Press.
- Jayne, T. S., Jones, S., Govereh, J., Nyoro, J., & Reardon, T. (1994). Market-oriented strategies to improve household food experience from sub-Saharan Africa. *MSU International Development Working Paper No* (15). Michigan: Department of Agricultural Economics, Michigan State University.
- Jazairy, I., Alamgir, M., & Panuccio, T. (1992). *The state of world rural poverty: an inquiry into its causes and consequences*. Rome: Intermediate Technology Publications.
- Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and change*, 30 (3), 435-464.
- Kabeer, N. (2003). *Gender mainstreaming in poverty eradication and the millennium development goals: A handbook for policy makers and other stakeholders*. Ottawa: International Development Research Centre.
- Kabira, W. (1997). *Gender training of trainers: An introduction*. Namibia: Collaboration for gender and development.
- Kandoole, B. F., & Msukwa, L. (1992). *Household food and income security under market liberalization: Experience from Malawi*. Food security research in Southern Africa: Policy Implications, Ed. J. B.
- Kempson, K., Keenan, D.P., Sadan, P.S., & Adler, A. (2003). Maintaining food

sufficiency: coping strategies identified by limited-resource individuals versus nutrition educators. *Journal of Nutrition Education and Behavior*, 35, 179-188.

Kent, R., MacRae, M. & Tripathi, R. (2009). *Unheard voices, women. Marginal farmers speak out: A Zambian case study*. London: Concern Worldwide.

Koester, U. (1986). *Regional cooperation to improve food security in Southern and Eastern African Countries*. Research Report 53. Washington, DC: International Food Policy Research Institute.

Kolavalli, S., Flaherty, K., Al-Hassan, R., & Baah, K. O. (2010). *Do Comprehensive Africa Agriculture Development Program (CAADP) processes make a difference to country commitments to develop agriculture? The case of Ghana*. In: IFPRI Discussion Paper (01006). Washington, DC: Development Strategy and Governance Division, International Food Policy Research Institute.

Lastarria-Cornhiel, S. (2006). Feminization of agriculture: trends and driving forces. *Background paper for the World Development Report, 2008*. Retrieved: July 21, 2014, from <https://openknowledge.worldbank.org/handle/10986/9104>.

Lipton, M. (1968). The theory of the optimizing peasant. *Journal of Development Studies*, April 327-351.

Long, N. (1997). Agency and constraint, perceptions and practices: A theoretical position. In: H. de Haan and N. Long (eds), *Images and realities of rural life: Wageningen perspectives on rural transformations*. Assen, The Wageningen: Van Gorcum.

- Longwe, S., & Clark, R. (1994). *Women in development, culture and youth workshop preparatory readings 1-3*. Lusaka: Longwe, Clark and Associates.
- Longhurst, R. (1983). Agricultural production and food consumption: Some neglected linkages. *Food and Nutrition* 9 (2), Rome: Food Agriculture Organisation of the United Nations.
- March, C., Smyth, I., & Mukhopadhyay, M. (1999). *A guide to gender-analysis frameworks*. London: Oxfam.
- Mayoux, L. (2000). *Microfinance and the empowerment of women. A review of the key issues*. Geneva: International Labour Organisation.
- Maxwell, S., & Smith, M. (1992). Household food security: A conceptual review. In: S. Maxwell & T. Fraakenburger (Eds.), *Household food security: Concepts, indicators, measurements* (pp. 1-72). New York and Rome: UNICEF and IFAD.
- Maxwell, D., & Wiebe, K. (1999). Land tenure and food security: Exploring dynamic linkages. *Journal of Development and Change*, 30, 825-849.
- Maxwell, D., Levin, C., Armar-Klemesu, M., Ahiadeke, C., Ruel, M. & Morris, S. (1998). *Urban livelihoods, food and nutrition security in Greater Accra*. Washington DC: International Food Policy Research Institute.
- McDonald, J. F. & Moffitt, R. A. (1980). The uses of Tobit analysis. *The review of economics and statistics*, 318-321.
- Meade, B., Rosen, S., & Shapouri. S. (2007). *Food Security Assessment, 2006*. Retrieved: July, 21 2014, from <http://www.ers.usda.gov/publications.a.spx>.

- Mehira, R. (1997). The role of non-governmental organisations: Charity and empowerment. *Annals of the American Academy of Political and Social Science*, 55. pp 10 -12.
- Mellor, J., (1988). Global Food Balances and Food Security, *World Development*, 16 (9), pp. 997-1011.
- Meinzen-Dick, R., Quisumbing, A., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M. & Beintema, N. (2011). *Engendering agricultural research, development and extension*. Washington DC: International Food Policy Research Institute.
- Ministry of Food and Agriculture (MoFA) (2002). *Food and agricultural sector development policy (FASDEP)*. Accra: Statistics, Research and Information Directorate, MoFA.
- Ministry of Agriculture (MoFA) (2005). *Agriculture in Ghana: Facts and figures*, Accra: Policy Planning and Monitoring and Evaluation Directorate.
- Ministry of Food and Agriculture (MoFA) (2009). *Food and agriculture sector development policy (FASDEP)*. Accra: Statistics, Research and Information Directorate, MoFA.
- Ministry of Food and Agriculture (2010). *Medium term agricultural sector investment plan (METASIP) 2011-2015*. Accra: Statistics, Research and Information Directorate, MoFA.
- Ministry of Food and Agriculture (2012). *Ghana maize strategy document and investment opportunities for the private sector*. Ministry of Food and Agriculture: Accra, Ghana.
- Ministry of Food and Agriculture (MoFA) (2013). Average Yield for Major

Crops in Ghana 2011- 2012: Ministry of Food and Agriculture.

Retrieved August 2, 2013 from: <http://MoFA.gov.gh/site/?page-id=5883>.

Mohiuddin, A. & Poonam, A. (1991). *Providing food security for all*. Rome: IFAD

Mosedale, S. (2005). Assessing women's empowerment: Towards a conceptual framework. *Journal of International Development*, 17, 243-257.

Moser, K. S. (1998). Metaphor analysis in psychology: Method, theory, and fields of application. *Qualitative Social Research*, 1(2), 7-25.

Moser, C. (2012). *Gender planning and development: Theory, practice and training*. New York: Routledge.

Mutangadura, G. B. (2004). *Women and land tenure rights in southern Africa: A human rights-based approach*. Lusaka: United Nations Economic Commission for Africa.

Mwanki, A. (2005). *Achieving food security in Africa: Challenges and issues*: Cornell University, USA.

Ndlovu, L. R. (1989). The role of livestock and small ruminants in promoting food Security. In: R. Mandivamba, G. Mudimu & T. S. Jayne (Eds.), *Food security policies in the SADC region* (pp. 242-250). Harare: Department of Agricultural Economics and Extension, University of Zimbabwe.

Nicola, P. (2003). *Food security crisis in Southern Africa: The political background to policy failure*. Birmingham: Birmingham University, International Development Department.

Niehof, A., & Price, L. (2001). *Rural livelihood systems: A conceptual*

framework. Wageningen-UPWARD Series on Rural Livelihoods No. 1.:
WU-UPWARD.

- Niehof, A. (2003). Gendered dynamics of food security. In: K. Ulmer (Ed), *No Security without Food Security No Security without Gender Equality*, pp. 60-68. Brussels: APRODEV.
- Nyariki, D. M. & Wiggins, S. (1997). Household food insecurity in sub-Saharan Africa: Lesson from Kenya. *British Food Journal*, 99 (7), 249-262.
- Nyachwo, A. T. (2003). *Human resource management guidelines to improve Relationships of employees in the rural wholesale business*. Unpublished doctoral thesis, University of Pretoria, Pretoria, South Africa.
- Oladeebo, J. O. & Fajuyigbo, A. A. (2007). Technical efficiency of men and women upland rice farmers in Osun State, Nigeria. *Journal of Human Ecology*, 22 (2), 93–100.
- Olumakaiye, M. F. & Ajayi, A. O. (2006). Women's empowerment for household food security: The place of education. *Journal of Human Ecology*, 19 (1), 51-55.
- Ongaro, W. A. (1990). Modern maize technology, yield variations and efficiency differentials: A case of small farms in Western Kenya. *Eastern Africa Economic Review*, 6 (1), 11–29.
- Onwuegbuize, A. J. & Leech, N. L. (2006). Linking research questions to mixed method data analysis procedures. *The Qualitative Report*, 11 (3), 474-498.
- Osafo, A. S., & Frempong, E. (1998). Lindane and endosulfan residues in water

and fish in Ashanti region of Ghana. *Journal of the Ghana Science Association* 135-140.

- Palriwala, R. (1990). Introduction. In: L. Dube and R. Palriwala (Eds), *Structures and strategies: Women, work and family* (pp. 15-55). New Delhi: Sage Publication.
- Pennartz, P., & Niehof, A. (1999). *The domestic domain: Chances, choices and strategies of family households*. Singapore and Sydney: Ashgate Publishing Ltd.
- Percy, R. (1999). Gender analysis and participatory rural appraisal: Assessing the current debate through an Ethiopian case study involving agricultural extension work. *International Journal of Education Development*, 19 (6), 395-408.
- Peterman, A., Quisumbing, A. & Behrman, J. (2010). *Review of empirical evidence on gender differences in non-land agricultural inputs, technology, and services in developing countries*. Discussion papers 1003, International Food Policy Research Institute (IFPRI).
- Quisumbing, A. R., Brown, L. R., Feldstein, H. S., Haddad, L. & Peña, C. (1995). *Women: The key to food security*. Food policy statement (21). Washington, DC: International Food Policy Research Institute.
- Radimer, K. L., Olson, C. M., Greene, J. C., Campbell, C. C., & Habicht, J. P. (1992). Understanding hunger and developing indicators to assess it in women and children. *Journal of Nutrition Education*, 24 (1), 36S-44S.
- Ravallion, M. (1989). *Poverty in theory and practice*. Washington DC: World Bank.

- Razavi, S., & Miller, C. (1995). *Gender mainstreaming: A study of efforts by the UNDP, the World Bank and the ILO to institutionalize gender issues*. Geneva: United Nations Research Institute for Social Development.
- Redclift, M. (1990). The Role of agriculture in sustainable development. In: P. Lowe, T. Marsden and S. Whatmore (eds), *Technological change and the rural environment*. London: David Fulton Publishers.
- Renzaho, A.M.N., and Mellor, D. (2009). *Food security measurement in cultural pluralism: Missing the point or conceptual misunderstanding?* *Nutrition* 26, pp 1–9.
- Rockefeller Foundation (2006). *Africa's turn: A new green revolution for the 21st century*. New York: Rockefeller Foundation.
- Rudie, I. (1995). The significance of 'eating': Co-operation, support and reputation in Kelantan Malay households. In: W. J. Karim (ed), *'Male' and 'Female' in developing Southeast Asia* (pp. 227-240). Oxford: Berg Publishers.
- Rutsch, H. (2003). *The role of sustainable fertilization: Global food security*. Source: UN Chronicle. 2003 September –November 40 (3): (2) p. 6.
- Saad, M. (1999). Food security for the food insecure: New challenges and renewed commitments. *CSD NGO Women's Caucus Position Paper for CSD- 8, 2000*.
- Saito, K. (1994). *Raising the productivity of farmers in Sub-Saharan Africa*. Washington DC: The World Bank.
- Santos, P., & Soroko, D. (1999). *Successes and challenges of food market*

- reform: Experiences from Kenya, Mozambique, Zambia, and Zimbabwe*. International Development Working Paper (72). East Lansing MI: Michigan State University, Michigan.
- Sarpong, B. D. (2010). *The state of agriculture in Ghana*. Private Enterprise Foundation (PEF). PEF/CIPE Project on Public-Private Dialogue in Agriculture Sector.
- Scherr, S. J. (1999). *Soil degradation: A threat to developing-country food security by 2020?* Washington DC: International Food Policy Research Institute.
- Schultz, T. W. (1964). *Transforming traditional agriculture*. New Haven: Yale University Press.
- Sen, A. K. (1981). *Poverty and famine: An essay on entitlement and deprivation*. Oxford: Clarendon Press.
- Sen, A.K. (1994). *Population: Delusion and reality*. New York: New York Review of Books.
- Sen, A. (1999). *Development as freedom*. Oxford University Press: Oxford.
- Shiferaw, B., Hellin J., & Muricho, G. (2011). Improving market access and agricultural productivity growth in Africa: What role for producer organizations and collective action institutions? *Food Security*, 3 (4), 475–489.
- Shipton, P. (1990). African famine and food security: An anthropological perspective. *Annual Review of Anthropology*, 353-394.
- Slade, M. E. (1986). Total factor productivity measurement when equilibrium is temporary. *Journal of Econometrics*, 33 (1), 75-95.
- Smith, L. (2002). *The use of household expenditure surveys for the assessment*

of food insecurity. Paper presented at the Measurement and Assessment of Food Deprivation, Under Nutrition International Scientific Symposium. Rome, Italy.

Stockbridge, M., Dorward, A., Kydd, J., & Poole, N. (2003). *Farmer organizations for market access: A briefing paper*. London: UK Department of International Development.

Strebelle, J., & Nyamekye, H. (2011). *Food security and intermediary farmer's organization: Assessing and identifying needs for capacity building of farmer's organization in six UEMOA and ECOWAS Countries*. Collective Strategies Alimentaries (CSA). Ghana country report.

Squire, P. J. (2003). Strategies for enhancing women's full participation in sustainable agricultural development and environmental conservation in sub-Saharan Africa. *Journal of International Agricultural and Extension Education*, 10 (1), 4-10.

Taylor, V. (1999). *Gender mainstreaming in development planning. A reference manual for governments and other stakeholders*. London: Commonwealth Secretariat.

Taylor, J. E., & Adelman, A. (2003). Agricultural household models: Genesis, evolution and extensions. *Review of Economics of the Household*, 1 (1), 33-58.

Tekola, Y. (1997). *The puzzling paradox of the African food crisis: Searching for the truth and facing the challenges*. Kuala Lumpur: UNECA, Bradford Press.

Thomson, A. & Metz, J. (1997). *Training manual for agricultural training*. Rome: FAO.

- Thomson, A. M., & Metz, M. (1999). *Implications of economic policy for food security: A training manual*. FAO: Rome.
- Timmer, C. P. (1998). Crop diversification in rice-based agricultural economies: Conceptual and policy issue. In: R. A. Goldberg (Ed.), *Research in domestic and international agribusiness management* (pp. 23-12). Greenwich, CT: JAI Press Inc.
- Tiruneh, A., Tesfaye, T., Mwangi, W. & Verkuijl, H. (2001). *Gender differentials in agricultural production and decision-making among smallholders in Ada, Lume and Gimbichu Woredas of the Central Highlands of Ethiopia*. Mexico City: International Maize and Wheat Improvement Center and Ethiopian Research Organization.
- USAID (2003). *Food access indicator review: Conceptualization and instrumentation of food insecurity*. Washington DC: Economic Research Service.
- USDA (1995). *Situation and outlook report: Feed grains, various issues*. Washington DC: Economic Research Service.
- Vorley, B., Fearn, A., & Ray, D. (2007). *Regoverning markets: A place for small-scale producers in modern agrifood chains?* London: Growers Publishing Limited.
- Walier, T. B. (2007). *Factors perceived as influencing the acquisition of agricultural knowledge and skills in senior secondary schools in the Upper West region, Ghana*. Unpublished Master thesis, University of Ghana.
- Walker, T., & Jodha, N. (1986). How small farmers adapt to risk. In: P. Hazell,

- C. Pomareda & A. Valdez (Eds.), *Crop insurance for agricultural development*. Baltimore: Johns Hopkins.
- Webb, P., Coates, J., Frongillo, E. A., Rogers, B., Swindale, A., & Bilinsky, P. (2006). Measuring household food insecurity: Why it's so important and yet so difficult to do. *Journal of Nutrition*, 136, 1404S–1408S.
- Whiteley, B. E. (1996). *Principles of research in behavioural sciences*. Mountain View: Mayfield Publishing Company.
- Workneh, N. (2006). Determinants of small farm household food security: Evidence from South Wollo, Ethiopia. *Ethiopian Journal of Development Research*, 28 (1), 1-29.
- World Bank (2007). *World development report 2008 overview: Agriculture for development*. Washington DC: International Bank for Reconstruction and Development/World Bank.
- World Bank. (2009). *World Development Indicators 2012*. World Bank Publications: Washington DC.
- Wunderlich, G. & Norwood, J. (2006). *Food insecurity and hunger in the United States: An assessment of the measure*. Washington DC: National Academic press.
- Yared, A. (2001). *Food security livelihood strategies and food security policy in Ethiopia.*, Addis Ababa: University of Adisababa.
- Zindi, C., & Stack, J. (1991). *Patterns of livestock ownership and distribution in Zimbabwe's communal areas*. Working Paper AEE (4/91). Harare: Department of Agricultural Economics and Extension, University of Zimbabwe.

APPENDIX

Interview Schedule for Smallholder Women Farmers Engaged in Maize Production in Techiman Municipality and Offinso North District of Ghana

This interview schedule has been designed to collect information for a research work on “Access to Agricultural Production Resources and its Effect on the Household Food Security of Smallholder Women Maize Farmers in the Techiman Municipality and Offinso North District of Ghana”

Your response to this interview questions will be appreciated to make the study successful.

Objective 1: Socio-demographic characteristics of respondents

1. Name of respondent -----
2. Study region and district -----

3. Age in years -----
4. Marital status (tick where appropriate)
i: Married () ii: Single () iii: Divorced () iv: Separated ()
5. Residential status of respondent (tick where appropriately)
i: Native () ii: Migrant ()
6. Farm size in acres-----
7. Source of land (tick where appropriate)
i: Purchased () ii: Lease () iii: Family land () iv: Freehold () v:
Inheritance () vi: Gift () vii: Other specify.....
8. Educational level of respondent (tick where appropriate).

11. If yes what is the name? -----

12. What are your reasons for joining a Farmer Based Organization?

Do you occupy an executive position in the Farmer Based Organization?

i: Yes () ii: No ()

If no why? -----

Objective 2: Level of Access to Agricultural Production Resources

13. Level of access to land for maize production (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

1. Level of access to hired labour (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

2. Level of access to tractor services (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

3. Level of access to extension services (MoFA or NGO) (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

4. Level of access to fertilizer (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

5. Level of access to weedicide (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

6. Level of access to certified seeds (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

7. Level of access to pesticides (tick where appropriate).

1: Do not access () 2: low access () 3: moderate access () 4: high access ()

14. What specific challenges do you encounter while accessing the following production resources?

- i. **Land** -----

What are the sources of land used for your maize production?-----

ii. **Hired labour**-----

How much does it cost to hire a labour per day for weeding?-----

How much does it cost to hire labour per day for harvesting maize?-----

ii. **Weedicide**-----

How much does it cost for ploughing an acre of land in year 2010 using a tractor?-----

How much does it cost for ploughing an acre of land in year 2011 using a tractor?-----

What are the sources of tractor services?-----

iv. Extension services (MoFA & NGOs)-----

How often within a month do you meet with a MoFA Extension Agents? -----

How often within a month do you meet with an NGO Extension Agents?-----

Is there a systematic programme where MoFA Extension Agents or NGOs
meet with farmers on their farms? -----

v. Pesticide -----

What are the sources of your pesticides for your maize production?-----

Do you use the pesticides for production or for storing the maize?

vi. Certified seeds-----

What are the sources of your seeds for maize production?-----

vii. Fertilizer-----

What type of fertilizer do you use for your production activities?

viii. Pesticides-----

What type of pesticide do you use for your production activities?

What type of weedicide do you use for your production activities?

ix. Extension services-----

How many times within year 2011 have you benefited from extension services from either MoFA or an NGO operating in your area? (field visit, attending demonstration & workshop)

What is your source of extension (tick where appropriate)

i: MoFA () ii: NGO ()

If an NGO, mention the names.-----

Objective Three: Yield levels of respondents

14. What was your yield per acre in the 2010 major season?
..... (bags)- *Ask for the type of bags in kg*

15. What was your yield per acre in the 2010 minor season?
..... (bags) –*Ask for the type of bag in kg*

16. Which varieties of maize did you cultivate in the year 2010?

17. What was your yield per acre in the 2011 major season?
..... (bags)- *Ask for the type of bags in kg*

18. What was your yield per acre in the 2011 minor season?

..... (bags)- *Ask for the type of bags in kg*

19. Which varieties of maize did you cultivate in the year 2011?

Objective Four: Percentage of maize contributed to the household

20. What percentage of your maize yield do you contribute to the household?

.....

Objective five and six: Household food security levels of respondents

21. What is the size of your household?

i: Two () ii: Three () iii: Four () iv: Five () v: Six ()

vi: Seven ()

22. Response to the following eleven (11) questions about food-related behaviours, experiences and conditions that are known to characterize households having difficulty in meeting their food needs by ticking where applicable.

(1) Obligated to eat less preferred food.

Yes () or No ()

(2) Need to borrow food to meet social obligations.

Yes () or No ()

(3) Took food (usually staples) on credit from a local market.

Yes () or No ()

(4) Worried frequently about where the next meal would come from.

Yes () or No ()

- (5) Need to purchase food often (because own production ran out).

Yes () or No ()

- (6) The family ate few meals per day on regular basis.

Yes () or No ()

- (7) The respondent adult cut back on amount of food consumed

Yes () or No ()

- (8) Needed to borrow food from relatives or neighbours to make a meal:

Yes () or No ()

- (9) The main working adult sometimes skipped entire meals (owing to an insufficiency of food in the household):

Yes () or No ()

- (10) There were times when food stored in the house ran out, and there were no cash to buy more:

Yes () or No ()

11. Other adults (not the main working adult) personally skipped entire:

Yes () or No ()

Objective seven: Coping strategies adopted by respondents

23. What coping strategies do you adopted to ensure that your household is food secured?

Production and sale of crops-----

Reduction in meals-----

Engagement inn petty trading-----

Engagement in on-farm paid job-----

Engagement in agro processing-----

Sale of livestock reared-----

Sale of forest products-----

Donations-----

Remittance from children-----
