

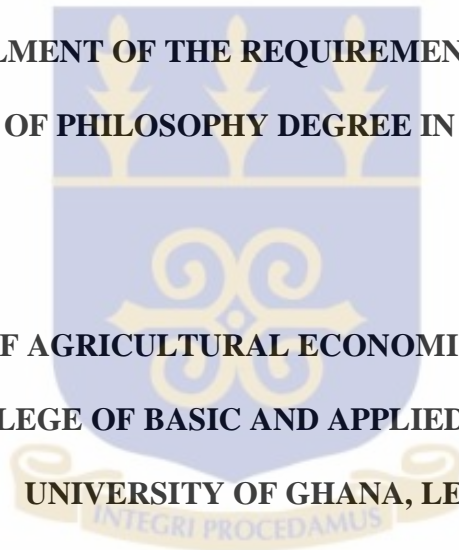
GENDER AND COTTON PRODUCTIVITY IN THE NORTHERN REGION

BY

NYAYON MICHAEL YAW

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF
MASTER OF PHILOSOPHY DEGREE IN AGRIBUSINESS**

**DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS
COLLEGE OF BASIC AND APPLIED SCIENCES
UNIVERSITY OF GHANA, LEGON**



DECEMBER, 2015

DECLARATION

I, Nyayon Michael Yaw, do hereby declare that except for references cited, which has been duly acknowledged, this work, GENDER AND COTTON PRODUCTIVITY IN THE NORTHERN REGION is the result of my own research. It has never been submitted anywhere in part or in whole for the award of any degree.

Signature

Date.....

Nyayon Michael Yaw

(Student)

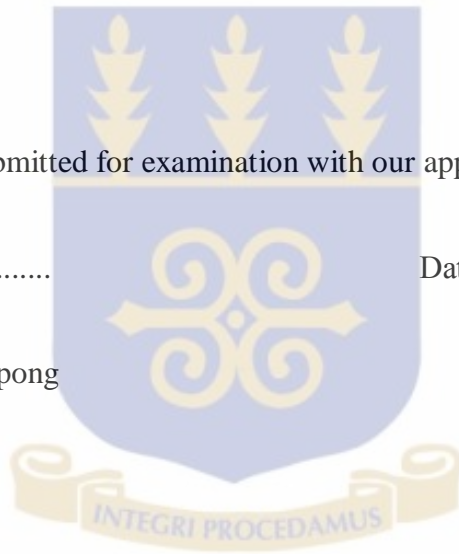
This work has been submitted for examination with our approval as supervisors

Signature

Date.....

Prof. Daniel Bruce Sarpong

(Major Supervisor)



Signature

Date.....

Prof. Wayo Seini

(Co-Supervisor)

DEDICATION

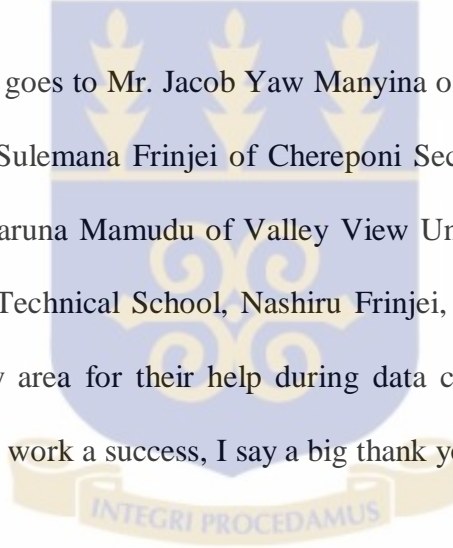
I dedicate this work to my Mum Madam Agnes Effeï and to my Dad Mr. J. Y. Kwabena for their love and care throughout the course of my study. I also dedicate this work to Mr. Jacob Yaw Manyina, to whom words cannot express my appreciation. Lastly, I dedicate this work to my lovely wife Salamatu Abdullah Nyayon, my lovely twins Abdul-Rahman Danaa Nyayon and Abdul-Raheem Dawuni Nyayon and to Fareedah Nacole Nyayon.



ACKNOWLEDGEMENT

My thanks go to the Almighty God for seeing me through this step of my academic pursuit. With God, all things are possible. Special appreciations go to my Supervisors, Prof. Daniel Bruce Sarpong and Prof. Wayo Seini for their patience and guidance in the preparation of this work. I pray that the Almighty God shower His endless blessing on them. Special thanks also go to all the staff of the Department of Agricultural Economics and Agribusiness for their support and encouragement throughout the duration of my study.

My profound gratitude goes to Mr. Jacob Yaw Manyina of Anglogold Ashanti. I am also grateful to Mr. Sadiq Sulemana Frinjei of Chereponi Secondary Technical School, Mr. Aminu Haruna, Mr. Haruna Mamudu of Valley View University, Mr. Adam Haruna of Chereponi Secondary Technical School, Nashiru Frinjei, all Wienco Cotton Production Assistants in the study area for their help during data collection. To all those who in diverse ways made this work a success, I say a big thank you. May God bless you.



ABSTRACT

This study examined gender differences in land productivity in cotton production in the Northern Region of Ghana. Data were collected from a sample of two hundred (200) cotton farmers made up of 120 males and 80 females with the help of Cotton Production Assistants. Data collected were analyzed using descriptive statistics and regression analysis. The Z test was used to test for the significance in the difference between the mean land productivities of male and female cotton farmers. A Cobb-Douglas production function was used to estimate the factors that affect land productivity of cotton farmers. Respondents between the ages of 31 years to 45 years made up 42.5% for males and 50% for females. The proportion of females having between 11 years to 20 years of farming experience in cotton production was 61.25% compared to 54.17% of males with no significant difference. Cotton farm sizes for both male and female farmers were small ranging between 1 to 3 acres. The results showed that males were more productive than females with a productivity difference of 71.06% and statistically significant at 1% level. Males on the average had 310.54kg/ha of seed cotton as compared to 181.55kg/ha for women. Regression results showed that gender of farmer, labour used on the farm, household size, ploughing in the months of May and June and the interaction term of gender and multiple farms were significant determinants of land productivity of male and female cotton farmers in the study area. One major recommendation from this study is that labour is a significant resource that contributes to productivity in cotton production. The study suggests that cotton companies should help women overcome the problem of limited access to labour by financing them to be able to hire labour for their cotton farms.

TABLE OF CONTENTS

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
CHAPTER ONE: INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	8
1.3 Research Questions	12
1.4 Objectives of the study	13
1.5 Justification of the Study	13
1.6 Organization of the Thesis	15
CHAPTER TWO: LITERATURE REVIEW	16
2.1 Introduction	16
2.2 Gender and Gender Roles	16
2.3 Resource Endowment	19
2.4 Productivity	20
2.4.1 Productivity Measurement	20
2.5 Factors Influencing Gender and Agricultural Production	22
2.5.1 Access to Land	22
2.5.2 Gender Division of Labour	25
2.5.3 Access to Extension Services and Technology	28
2.5.4 Access to Credit	31
2.5.5 Market Access	33
2.6 Wienco cotton out grower scheme	35
2.7 Empirical Studies on Gender and Productivity	36
CHAPTER THREE: METHODOLOGY	40
3.1 Introduction	40
3.2 Description of Study Area	40
3.3 Conceptual Framework	42
3.4 Method of Data Analysis	44

3.5 Measurement of Variables and Apriori Expectations	48
3.6 Sample Size and Sampling Procedure	52
3.7 Sources of Data and Data Collection Techniques	53
CHAPTER FOUR: RESULTS AND DISCUSSION	54
4.1 Introduction	54
4.2 Gender Characteristics of Cotton Farmers	54
4.3 Comparing Mean Land Productivities of Male and Female Cotton Farmers	63
4.4 Factors Influencing Land Productivity Differentials	64
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS	68
5.1 Introduction	68
5.2 Summary	68
5.3 Finding and Conclusions	69
5.4 Policy Recommendations	71
REFERENCES	74
APPENDICES	83
APPENDIX 1: QUESTIONNAIRE	83
APPENDIX 2: Linear Regression Table of Factors Influencing Land Productivity	86

LIST OF TABLES

Table3. 1 Measurement of Variables and A Prior Expectation	51
Table3. 2 Numbers of Farmers in Selected Coverage Areas and Number Selected	52
Table 4. 1 Frequency Distribution of Age Respondents	55
Table 4. 2 Frequency Distribution of the Methods of Fertilizer Application	55
Table 4. 3 Frequency Distribution of Years of Farming Experience of Respondents	56
Table 4. 4 Frequency Distribution Means of Land Acquisition	57
Table 4. 5 Frequency Distribution of Multiple Farms in addition to Cotton	58
Table 4. 6 Frequency Distribution of Labour Used by Respondents	58
Table 4. 7 Frequency Distribution of the Month of Plough of Farmer's Fields	59
Table 4. 8 Frequency Distribution of Household Sizes of Respondents	60
Table 4. 9 Frequency Distribution of Household Head Status among Gender	61
Table 4. 10 Frequency Distribution of the Source of Labour Used among Gender	62
Table 4. 11 Output Distributions of Respondents	63
Table 4. 12 Comparing the Mean Land Productivities of Male and Female Farmers	63
Table 4. 13 Factors Influencing Land Productivity Differentials	65

LIST OF FIGURES

Figure 1 Cotton Production in Ghana and other Sub-Saharan African Countries	2
Figure 2 A map of the Northern Region of Ghana showing the Districts.	42
Figure 3 Conceptual Framework of how gender roles influence cotton productivity	43

LIST OF ABBREVIATIONS

ALINe	Agricultural Learning and Impacts Network
CPA	Cotton Production Assistant
FAOSTAT	Food and Agriculture Organization Statistics
GIZ	German International Cooperation
GoG	Government of Ghana
JICA	Japan International Cooperation Agency
MOWAC	Ministry of Women and Children's Affairs
MGCSP	Ministry of Gender, Children, and Social Protection
MOFA	Ministry of Food and Agriculture
OLS	Ordinary Least Square
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USDA	United States Department of Agriculture
WIAD	Women in Agricultural Development
WGL	Wienco Ghana Limited

CHAPTER ONE

INTRODUCTION

1.1 Background

Agriculture is the oldest profession that has helped to maintain and sustain humanity. Although agricultural sector dominates the economies of most developing countries because it is the major employer, the sector is underperforming in many countries for several reasons. The poor performance of the sector has led to high prices for foodstuffs as well as huge importation of food, raising serious concerns to many governments, especially in Latin America and Africa.

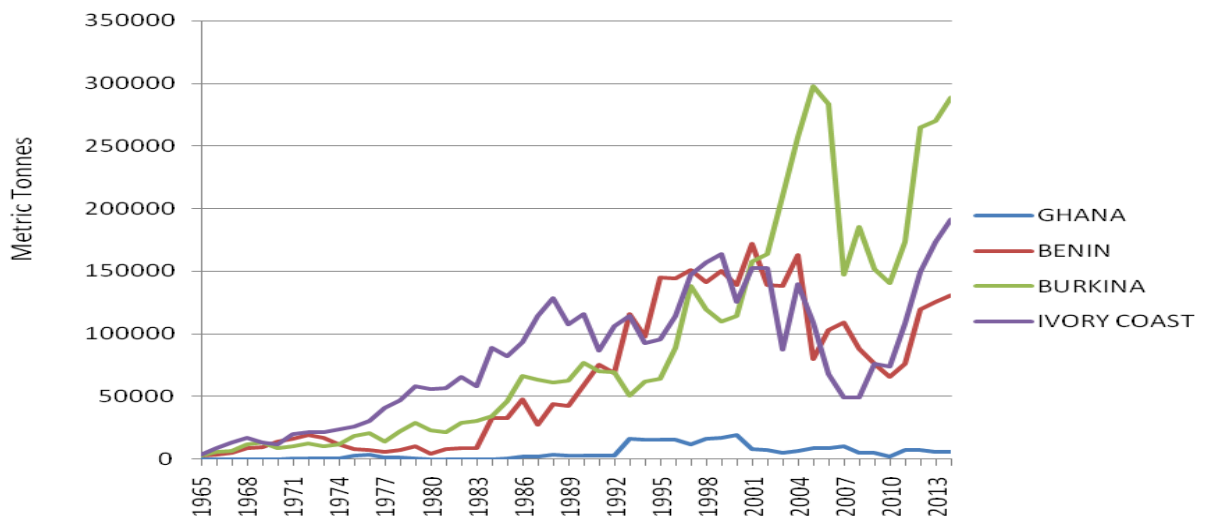
Cotton is one of the most important export commodities in the agricultural sector in Africa. Cotton production is an important factor in driving economic development in Africa with the continent producing about 5% of the global production, which constitutes about 10% to 15% of the world market share (GIZ, 2013_a). This makes Africa the fourth largest cotton exporter with almost the bulk of these exports coming from the sub-Saharan part of the continent, accounting for up to 35% to 75% of the agricultural export earnings in the region (GIZ, 2013_a). About 1.5 billion U.S. dollars is generated by Sahel states in Africa from cotton exports alone (*Ibid*).

Cotton is cultivated in crop rotation with staple food crops (such as corn and sorghum) under mostly rain-fed conditions. About, twenty million people are directly or indirectly associated with cotton production (GIZ, 2013_a).

Agriculture is important to the overall economic development of Ghana. Until the recent discovery of oil in Ghana, the performance of the agricultural sector has been the major driver of the Ghanaian economy since independence. According to Asuming-Brempong (2004), a significant portion of Government of Ghana revenue is from agriculture mainly through duties paid on the export of agricultural commodities, especially cocoa, which has been the major contributor to Ghana's foreign exchange earnings for several years.

The cotton belt in Ghana is similar in agro-ecology to other cotton-producing countries in the West African sub-region such as Benin, Mali and Burkina Faso. However, Ghana's production of cotton has been erratic compared to other cotton-producing countries in sub-Saharan Africa. Production in Ghana has never been more than 40,000 tonnes since the introduction of cotton production in 1968 (UNIDO *et al.*, 2011).

Figure 1 Cotton Production in Ghana and other Sub-Saharan African Countries



Source: USDA, 2014.

Ghana's cotton constitute less than 1% of the total production in West Africa, although the country has excellent conditions for cotton production (UNIDO *et al.*, 2011).

According to Thurow and Kilman (2010), the decision of most African leaders in the 1980's to channel resources to other sectors of their economies other than agriculture, led to the reduction of availability of very important extension services, elimination of subsidies on agricultural inputs, and stagnation and deterioration of markets. Ghana is no exception and there is a general decline in the country's agriculture sector, which contributed to the collapse of the once booming cotton industry.

Constraints identified along the value chain that negatively affected the performance and competitiveness of the cotton sector included lack of coordination between input providers, farmers, traders and ginners. In addition, there was no regulatory framework to ensure proper grading to meet international standards as well as fair pricing. The inadequacy of inputs and low level of mechanization leading to poor yields as well as no by-product utilization also contributed to poor competitiveness of the sector (UNIDO *et al.*, 2011).

In 2010, the Government of Ghana invited development partners to participate in a Cotton Sector Revival Strategy to promote Northern Rural Growth Project. This project took a value chain approach to improve the competitiveness of the sector by introducing technologies that allowed for improved cotton yields while providing maximum protection of natural resources and providing skills and capacities. This was to ensure the

production of high quality cotton, piloting cotton by-product utilization, identifying, and promoting investment opportunities for downstream processing. The aim was to increase income generation and employment opportunities in cotton farming communities in Ghana.

However, this effort by the government including the participation of the public to revive the cotton sector could not help salvage the situation. The Government of Ghana made a concession that allowed some companies including Olam, Wienco and Armajaro to restart cotton production as a cash crop in the cotton producing areas of the country, after about a decade of dormancy.

This decision by the government was influenced by the attractive international market prices of cotton and the success of the Burkinabe cotton sector. Each of these companies operating in the Northern Region assumes the role of inputs, extension and tractor service providers for the farmers in groups. They also buy seed cotton from farmers for export.

The interventions have given the opportunity to farmers engaged in cotton production, especially women who engage in agricultural activities for economic benefits, to have equal access to inputs as their male counterparts. The farmers receive their inputs on credit and later pay back upon delivery of the seed cotton at the end of the production season. In this regard, having the land to produce guarantees a farmer to have equal access to the services and inputs provided by the companies.

In Ghana, women constitute majority of smallholder farmers and provide about 70% to 80% of farm labour (Duncan and Brants, 2004). However, most of the labour provided by women is on farms belonging to male farmers because most often women have no access to farmlands. This is due to the definition of socio-cultural roles and responsibilities among gender, a situation that strongly influence land ownership rights (*Ibid*). The Ministry of Gender, Children, and Social Protection in Ghana has the mandate to coordinate responses to gender inequality and promote implementation of activities and programs to facilitate gender mainstreaming.

Other institutional structures that exist are the Women in Agricultural Development (WIAD) under the Ministry of Food and Agriculture (MOFA). The Directorate for Women in Agricultural Development is primarily responsible for coordinating programmes for women farmers, especially in rural areas, in conjunction with the Ministry that has been charged to oversee issues of gender and development (MOWAC, 2012).

Despite women being the major contributors of the labour force for agricultural production, there is a perception from literature (Clark, 2013; Koru and Holden, 2008; Villabon, 2012; Thapa 2008) that women are less productive than their male counterparts are when it comes to agricultural production. This distinction in productivity is mostly influenced by ideological, religious, economic, ethnic, and cultural determinants, which largely contribute to the differences in access to productive resources between men and women engaged in farming (Lilja *et al.*, 1998; Peterman *et al.*, 2011).

The productivity and economic empowerment of women is an area of concern to many government programs and policies geared towards the promotion of agricultural development. However, this can be justified if women's agricultural production is considered as a source of economic growth and as a benefit to rural livelihood and poverty reduction (Villabón 2012).

Male and female farmers share many responsibilities and engage in varying economic activities geared towards increasing their economic benefits. They have different needs and encounter different constraints because of their activities. In agricultural production, women are more constrained as compared to men in terms of access to inputs such as information technology and credit among other factors (Quisumbing, 1995, Kinkingninhoun-Me[^]dagbe' *et al.*, 2010). The situation arising is usually a continuous one with women being marginalized and thus limiting their effective participation in achieving food security (Quisumbing, 1995).

A number of studies on the productivity differences between male and female farmers to ascertain whether the differences in productivity is due to input constraint because of socio-cultural constructs or inherent on the part of women have mixed results. The differences in results could be attributed to the differences in approach with some studies (Jamison and Lau, 1982 and Ragasa *et al.*, 2012) controlling for differences in farm inputs other than land and labour and others (Clark, 2013; Koru and Holden 2008) do not.

Jamison and Lau (1982) observed that gender of the household head does not significantly affect output, except when better inputs and approaches to farming are used. This was further reiterated by Ragasa *et al.*, (2012) that plots of female heads and female plot managers are as equally productive as their male counterparts if they had access to the same level of inputs. According to Udry *et al.*, (1995), Koru and Holden (2008) and Clark (2013) gender yield differentials are due to the gender bias in allocation and use of inputs than the efficiency.

Quisumbing (1996) posits that the findings by most of the studies on the gender based gap in productivity is smaller than expected or may not even exist with proper control for access to quality land and vital agricultural inputs such as seeds, fertilizer, and water. Peterman *et al.*, (2011), conclude that most of the studies that reviewed gender productivity are erroneous by not considering allocation biases of inputs and the cause of input and crop choice at the household level, many of which are culture and context specific.

Women, by gender roles, are often marginalized in the decision-making process regarding agricultural development. Aregu *et al.*, (2010) report that gender roles and relationships influence the division of work, the use of resources, and the sharing of the benefits of production between women and men. Peterman *et al.*, (2011) assert that gender inequalities resulting from gender roles and the inadequate attention paid to this problem in agricultural development contributes to lower productivity among women.

In Northern Ghana, gender segregation has led to women being affected more by poverty and food insecurity. Fofie and Adu (2013) however point out that though there have been policies and legislative reforms that seek to address the problem of gender inequality resulting from gender roles, several cases of gender inequality still exist in Ghana.

1.2 Problem Statement

Women's unequal access to, and control over economic and financial resources can be attributed to societal perception of gender roles. Such perception does not encourage women to use their full potential to contribute to equitable and sustainable economic growth and development.

Gender equality in the distribution of economic and financial resources is therefore critical as it has positive multiplier effects for a range of key development goals, including poverty reduction (UNDESA, 2009). Women continue to be excluded from key decision-making forums addressing the allocation of economic and financial resources and opportunities, which further perpetuates gender inequality (*Ibid*).

The contribution of women to economic growth and development is not adequately represented because the majority of their activities are in the informal low-growth low-return areas and are subsistent (Amu, 2005). The existence of this phenomenon result from cultural and social inequalities from gender relations or gender roles that prevail within households making the male head having a high level of control (*Ibid*).

Women who engage in paid work often face a double workday, since they may only be allowed to work as long as their domestic duties are still fulfilled. This means women are time poor and the time burden may affect their health and wellbeing as well as their productivity (Bradshaw *et al.*, 2013).

According to Ellis *et al.*, (2006), women spend more of their time looking after their families, working on their husbands' gardens and producing food for their households. These activities of women dictated by gender roles constrain them in terms of labour and therefore their inability to expand their production for the market.

When women do engage in paid work, it can improve their voice in the home and ability to influence household decision-making. However, gender role is a hindrance to this development. This can also be a potential to spark conflict in the home, especially if women earn more than men, or women's employment coincides with men's under employment or complete unemployment (Amu, 2005).

According to Bradshaw *et al.*, (2013), the identification of women as being reliable, productive and a source of cheap labour force make them the preferred workforce for textiles and electronic transnational corporations. In addition, the perception of women as 'good with money,' including being better at paying back of loans, has led them to be targeted in microfinance programmes. Recognition of women as more efficient distributors of goods and services within the household has also made them a target with resources aimed at alleviating poverty, such as cash transfer programmes.

There has been an increase in the number of policies, programmes and projects designed to assist women to help them achieve economic independence in all spheres of their lives and to improve their participation in public life and the decision making process in developing countries (Amu, 2005). This concern for women's needs has coincided with recognition of their important role in development.

Women play a key role in the economic development across the globe by taking care of the economies they find themselves in by providing care to the young, old and the sick, thereby ensuring a productive workforce (Bradshaw *et al.*, 2013). As this work is not remunerated, it is undervalued and lies outside general conceptualisations of economies (*Ibid*).

Kabeer and Natali (2013) posit that the relationship between gender equality and economic growth is asymmetric arguing that the evidence that gender equality, particularly in education and employment, contributes to economic growth is far more consistent and robust than the contribution of economic development to gender equality in terms of health, wellbeing and rights. There would be the need to reformulate growth strategies to be more gender inclusive in their impacts (*Ibid*).

With the multiple responsibilities and gender-related constraints, the entrepreneurial spirit of women has made them active in various sectors of African economies (UNCTAD/UNDP, 2008). Giving them appropriate empowerment and encouragement by

taking into account their multiple roles, responsibilities and limitations, they could contribute significantly to economic growth and development on the continent (*Ibid*).

Peterman *et al*, (2011) assert that gender inequalities resulting from gender definition of roles and the inadequate attention paid to this problem in agricultural development contributes to lower productivity among women. Adesina and Djato (1997) argue that given the necessary resources and the same enabling environment as their male counterpart in farming activities, women farmers are equally efficient in the utilization of these resources to achieve higher productivity. Similarly, Ragasa *et al.*, (2012) found that plots of female heads and female plot managers are as equally productive as their male counterparts .

Contrary to the above findings, Horrell and Krishnan (2006) had different findings in cotton production. After controlling for the differences in inputs other than land and labour by using an out grower scheme, they observed a difference in the productivity of male household heads and female household heads in cotton production. Female cotton farmers who are household heads had lower productivity than their male counterparts did.

In West African countries, cotton production is done on smallholder farms as a cash crop combined with other crops (Hussein, 2008). Women play an important role by contributing a large portion of the labour force in cotton production by helping in farm activities such as planting and weeding among others since they do not have access to the land and inputs to engage in cotton production themselves (*Ibid*).

In Ghana, cotton companies such as Wienco Cotton Ltd provide a package that support farmers with inputs and services (weedicides, seeds, fertilizer, insecticides, extension service and tractor service) for cotton production. These companies also provide a readily available market for farmers by purchasing the seed cotton from farmers, which they gin for cottonseed and lint for export.

Farmers who participate in the scheme must have land for cultivating only cotton (with no intercrop). They form groups and act as out growers. The problem to address is whether there are differences in productivity between male and female cotton farmers when differences in inputs other than land and labour are controlled for, and what factors influence this difference in productivity.

1.3 Research Questions

With the participation of women in cotton production where men and women have equal access to same inputs, the main research question is; is there a difference in productivity of male and female cotton farmers? The following specific research questions are addressed:

- 1) What is the nature of the resource endowments of male and female cotton farmers in the Northern Region?
- 2) Are there productivity differences between male and female cotton farmers?
- 3) What are the factors that influence productivity differences in cotton production?

1.4 Objectives of the study

The general objective of the study is to assess farm productivity differences among male and female cotton farmers in the Northern Region. The specific objectives are:

- 1) to describe the nature of resource endowments of male and female cotton farmers.
- 2) to estimate the productivity differences between male and female cotton farmers.
- 3) to empirically estimate factors that affect productivity differences in cotton production.

1.5 Justification of the Study

Most studies conducted especially from across the developing world have shown that in terms of agricultural output women produce less than men do (Njuki *et al*, 2006). Most of these studies have actually measured productivity of men and women farmers without taking into account women's limited access to resources (*Ibid*).

According to Peterman *et al.*, (2011), most of the studies that reviewed gender productivity were quite erroneous by overlooking allocation biases of inputs and the inner cause of input and crop choice many of which are culture and context specific and on the division of labour. In addition, most of the studies used male-headed and female-headed households as a basis for categorising farms into male managed and female managed which did not properly reflect gender roles in productivity (*Ibid*).

Yields depend on proper planting and maintenance of crops that usually is relegated to women and typically require more time, patience, and backbreaking as well (Hussein,

2008). Women are more involved in farming activities during production such as planting, weeding, watering, harvesting, and post harvest activities such as transportation of farm produce, agro-processing and the marketing of small amounts of farm produce (Duncan and Brants, 2004).

Dicta *et al.*, (2013) observed that males are more available especially during the period of land preparation as it is regarded as a tedious energy consuming activity. Women farmers who cannot prepare or till the land because it is an energy draining exercise, usually employ male labour to do so.

Harvesting can be physically demanding too, but even plots managed by women usually have access to male labourers (Clark, 2013). Hill and Vigneri (2011) stated that female-managed cocoa farms in Ghana are as productive as male-managed ones and female farmers became more productive than their male counterparts did by an increase in the hired labour component of their inputs. This points out that there is more to explain the productivity gap than just the physical differences between men and women.

Studies by (Clark, 2013; Koru and Holden, 2008; Chavas *et al.*, 2005), show that women and men engage in agricultural production which is essential to economic growth of developing countries. Yet the output of women is below levels that can give them economic benefits as compared to men. This is mostly caused by gender disparities, which limit women's access to inputs that can enhance their productivity. For agricultural growth to make an impact on the economy, these gender disparities must be addressed.

Despite the crucial role of the agricultural sector in the Ghanaian economy, studies on gender and agricultural production are relatively scarce. The main purpose of this paper is to contribute to the knowledge base about implications of gender roles for the development of the agricultural sector in Ghana. This study will also propose measures that will reduce the difference in agricultural productivity that result from gender roles in agricultural production. The study will also provide a basis for further research on the impact of gender on agricultural productivity.

1.6 Organization of the Thesis

The rest of the thesis is organized as follows. Chapter two deals with the review of relevant literature. Chapter three outlines the study area and methods used to address the various objectives, the sample size and sampling techniques, methods of data collection and data analysis. Chapter four presents the results of the study and chapter five presents the summary, conclusions, and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on the definition of concepts used in the study, including gender roles, productivity and its measurement and resource endowments. It also reviews literature on research on the factors that affect gender and agricultural production.

2.2 Gender and Gender Roles

Reeves and Baden (2000) define gender as the socially determined ideas and practices of what it is to be female or male. According to Njenga *et al.*, (2011) gender roles are the socio-cultural constructs of roles in terms of responsibilities, characteristics, attitudes and beliefs among men and women, including the young and old. These roles and relationships are learned, change over time, and vary widely within and between cultures.

Gender as a social construct, link sex to expected characteristics and behaviour, as such men are endowed by law and custom with property rights as well as the control of labour as women are sometimes viewed as too weak or too emotional to have such control (Flora, 2001).

Gender analysis focuses on the different roles and responsibilities of women and men and the effects of these on society, culture, the economy and politics (Reeves and Baden, 2000). Important differences exist between women and men in their quality of life; in the

amount, kind and recognition of work they do; in health and literacy levels; and in their economic, political and social standing (*Ibid*).

According to Moock (1986), gender is fundamental to understanding social structures and expectations including decision-making processes and responsibilities, how risk-loving members of the society are and their rights to benefits due to technological improvement. The social relations of gender include all aspects of social activities with particular emphasis on the exercise of authority, access to and control of resources for production, distribution of income, and remuneration for work as well as cultural and religious activities.

By gender roles, women have many responsibilities that range from productive to reproductive (such as child bearing and child rearing); as a result, they become resilient in order to be able to do multiple tasks (The Montpellier Panel, 2012). Aregu *et al.*, (2010) report that gender roles and relationships influence the division of work, the use of resources, and the sharing of the benefits of production between women and men.

Bhagowalia *et al.*, (2007) argue that roles within the household by gender have an effect on how households invest in agriculture. Households with more males would tend to invest more in agriculture for reasons including more labour force to facilitate work and the guarantee of inter-generational transfers of land and accumulated wealth to males. This means that intensity of cropping and agricultural productivity may depend on not

only technology and credit constraints but by perceptions regarding the relative economic value of the contributions of males and females.

Women by gender roles are marginalized in the decision-making process regarding agricultural development (Ogunlela and Mukhtar, 2009). This constitutes a bottleneck to development and therefore a need for a review of government policies on agriculture to all the elements that place women farmers at a disadvantage (*Ibid*). Peterman *et al*, (2011) echo this observation by reporting that gender inequalities resulting from gender roles and the inadequate attention paid to this problem in agricultural development contributes to lower productivity among women.

In northern Ghana, the gender segregation has led to women being affected more by poverty and food insecurity. Women are not included in decision-making on the use of resources (Bambang and Abubakari, 2013). For instance, customarily, women cannot inherit land be it from their family or their spouses (Agana, 2012). Women gain access to land as gifts from their husbands and male relatives for survival. Fofie and Adu (2013) however point out that though there have been policies and legislative reforms that seek to address the problem of gender inequality, several cases of inequality especially in land tenure system exist in Ghana.

2.3 Resource Endowment

Resource endowment refers to the natural and social resources available within the borders of a country (Suranovic, 2010). This encompasses the natural resources (minerals, farmland, forest, etc.), human resources (labour and skills), and capital stock such as machinery, infrastructure and communications systems among others (Suranovic, 2010; Barbier, 2003). These three categories of resources contribute to the welfare of humans through the economic processes independently.

According to Barbier (2003) physical resource, consist of architecture and other components of cultural heritage. Natural resource consists of the aesthetics of natural landscape and is variety of ecological services that are crucial for economic growth, especially agricultural production in agro-based economies. Human resource consists of the overall stock of the human knowledge. However, Jalloh (2013) posits that proponents of literature on resource have made the point that the possession of resources does not necessarily confer economic growth.

The Organization for Economic Co-Operation and Development (2011) argues that nations endowed with natural resources may have them as opportunities for development or a curse. The resource curse, which is associated with poor development outcomes, has been experienced by many countries, though with different causes. “Poor economic performance in many natural resource-rich economies may have been caused by weak resource management institutions and imperfect structures of ownership and control in particular” (*Ibid*).

According to Sachs and Warner (1995), resource poor economies often do better in terms of economic growth than resource-rich economies, arguing that this phenomenon is a pattern of economic history. The inverse relationship between resource and economic growth poses a puzzle in the sense that it is expected that resources raise the wealth and purchasing power of an economy over imports thereby raising investments and growth (*Ibid*).

2.4 Productivity

Eatwell and Newman (1991) define productivity as a ratio of some measure of output to some index of input use. Productivity is therefore nothing more than the arithmetic ratio between the amount produced and the amount of any resources used in the course of production; thus, productivity is the output per unit input utilized. According to Wazed and Ahmed (2008) one of the categorizations based on technological concept that can be drawn from within the similar definitions of productivity is the relationship between ratios of output to the inputs used in its production.

2.4.1 Productivity Measurement

Productivity and performance measurement have been regarded as a prerequisite for continuous improvement (Kaydos, 1991). At national and international levels, economists have designed many approaches such as the total factor productivity (TFP) and partial factor productivity (PFP) measurements. Either movements in the best “best practice” production technology or a change in the level of efficiency can cause changes in output per unit input (Rogers 1998).

The use of productivity measurement is to compare measures from comparable facilities producing similar outputs (Banker *et al*, 1989). Productivity measures attempt to highlight improvements in the physical use of resources chiefly to motivate and evaluate attempts to produce more outputs with fewer inputs while maintaining quality (*Ibid*).

The ideal way of practically finding out how well inputs have been put into use is through productivity measurement (Gupta and Dey, 2010). Total productivity is the total output divided by the sum of all inputs. It may be expressed as:

$$\text{Total productivity} = \frac{\text{Total Input}}{\text{Total Output}} \dots\dots\dots (1)$$

However, the measurement of total productivity is very difficult in practice in the sense that different outputs (products and services) and inputs (e.g. labour, material, and energy) cannot be summed up (Gupta and Dey, 2010). An obvious solution therefore would be to use monetary values but then it would amount to profitability measurement (*Ibid*).

It would therefore be more appropriate to use partial productivity measures to determine how much each input has contributed to the total output. A partial productivity ratio is computed by dividing total output by an input factor. Finding the partial factor productivity (PFP) may be expressed as:

$$\text{PFP} = \frac{Q_i}{X_i} \dots\dots\dots (2)$$

Where: Q_i = quantity of cotton produced by each farmer

X_i = Unit of input

In this regard, total factor productivity (TFP) can be said to be the aggregation of partial factor productivities (Banker *et al*, 1989).

2.5 Factors Influencing Gender and Agricultural Production

Several authors, Duncan and Brants, (2004); Thapa, (2008); and Ragasa, (2012) have attributed the poverty of women to the inequalities arising from gender roles and responsibilities. These inequalities prevail in access to productive resources such as land, labour, capital, information/extension services and access to markets; as well as neglect of women's needs.

2.5.1 Access to Land

Nicholas *et al.*, (1999) define access as the right or opportunity to use, manage or control a particular resource. Land tenure is the set of rules that determines how land is used, possessed, leveraged, sold, or in other ways disposed of within societies (Garvelink, 2012).

Access to and control of land is an important and very crucial aspect of improving the livelihood needs of the rural poor. In Ghana, institutional challenges continue to prevent most people especially the rural poor of which women are the majority from gaining access to secure land tenure rights. This development does not support the important role women play in agriculture in ensuring food security (Mauro and Pallas, 2009).

Women's unequal access to land is a key obstacle to their productivity. Women's access to, control over and ownership of land are constrained by customary laws and by attitudes and practices that reflect the position of women as subordinates to men (Keller, 2000). In rural and urban areas in Zambia, and whether educated or not, women do not have equal opportunity to access, inherit and buy land in comparison with men (*Ibid*).

Keller (2000) posits that married women in rural areas in Zambia gain access to land for farming through their husbands. In the event of divorce or widowhood, they may continue to use the land, but under customary law, they are prevented from inheriting the land. Most divorced or widowed rural women return to their natal families, where they are dependent upon male kin for access to land. These situations come about because of gender roles that society defines for males and females (*Ibid*).

The challenge facing women owning land forces married women to avoid provocation and the risk of divorce by even mentioning the possibility of joint ownership, even when they have the financial means to contribute to land purchase (Keller, 2000; Himonga and Munachonga, 1991). Women who own properties are seen as self-assertive and difficult to control and often do not obey rules, and therefore not marriage worthy. This belief may discourage women from buying land and/or pursuing their inheritance rights (Quansah, 2012).

Duncan and Brants (2004) report that, men have greater control over land than women do, a situation strongly influenced by land ownership rights defined by custom. Land ownership is largely vested in lineages, clans and family units and its control is ascribed to men by lineage or clan heads. Land ownership among women is still an exception but is becoming conspicuous in recent times due to the increased purchase of land by women and an increased receipt of land by women as gifts from parents, grandparents and/or spouses (*Ibid*).

According to Agana (2012), the Frafras in Northern Ghana traditionally see land as a source of power, authority, and identity to the community, clan and family as well as the individual. Land was not in the past sold, as it was a taboo to do so because of the belief that land is a spirit and not anyone who exchanges it for money will live long. Again, women have limited access to land because they do not perform sacrifices to ancestral gods, and daughters are expected to marry and wives too would be housed and fed by their husbands.

Fofie and Adu (2013) posit that other factors in the Ghanaian context such as lack of awareness and education on land reforms and policies coupled with escalating land prices and complicated land transaction method are the major challenges to women's access and security over land. The decentralization of the land title registration process, gender mainstreaming in the land title registration process, and intensification of advocacy on land rights, among others are crucial to improve women's access, control, and security over land for agricultural purposes (*Ibid*).

Nonetheless, in Northern Ghana, the people practice patrilineal system of inheritance and hence control over resources generally follows a gender-segregated pattern based on traditional norms. This limit the land rights of women resulting in land being concentrated in the hands of men. Property rights remain with male children who inherit their fathers (Adolwine and Dudima, 2010). However, urban land is not strictly within the influence of customary laws and practices as in rural areas where women mostly access land through husbands or other family relations.

According to Bambangi and Abubakari (2013), women in Northern Ghana rarely get the chance to cultivate virgin lands and even if they do, the ownership of such parcels of land would normally revert to men within a generation after the woman passes because of the leadership status of men over women. However, on the contrary the passing away of the man, does not give ownership of land to the woman but either to the eldest son in the family or to other men in the clan.

2.5.2 Gender Division of Labour

This is the socially determined ideas and practices defined by gender roles what activities are deemed appropriate for women and men (Reeves and Baden, 2000). In the household, men and women are involved in different activities to ensure the availability of goods and services for family consumption and well-being. “The gender relations such as division of labour that results in women generally working longer hours as they must combine reproductive and productive responsibilities makes it difficult for them to move from

subsistence agriculture to more prominent positions in market-based agriculture” (ALINe, 2011).

Aregu *et al.*, (2010), report that the division of farm tasks between women and men varies according to the enterprise, the farming system, the technology used, and the wealth of the household. However, there is an unequal relationship as far as gains from this type of relationship is concerned as socio-cultural endowments ascribe the types of responsibilities and activities with differing powers and consequently confer more power to some people than others (Sikod, 2007).

According to Aregu *et al.*, (2010) sharing the proceeds of production varies between women and men, partly reflecting their labour input, the use of produce in the home or for sale, cultural norms regarding male and female enterprises, and the dominance of men as the household head. With these factors in play, men are entitled to the greater portion.

Omwoha (2007) posits that due to the changes in the division of labour among gender, the work of women intensifies, bringing about a loss of economic independence and social status, changes in cropping patterns and farm technology. Women due to this time constraints are compelled to cultivate smaller portions if even they are allowed access to land and therefore do not enjoy the benefits of having large farm size for increased productivity (*Ibid*).

Ibrahim and Ibrahim (2012) note that women have additional work and less assistance and are therefore under greater pressure and the consequence of this is that many projects in development efforts ignore particularly rural women as the situation in which (rural women) find themselves are not understood. The multiple responsibilities and gender-related constraints can mean that women are not able to take advantage of the opportunities provided by trade expansion to the same degree as men.

The entrepreneurial spirit of women has made them particularly active in various sectors of African economies. Given appropriate empowerment and encouragement by taking into account their multiple roles, responsibilities and limitations, they could contribute significantly to economic growth and development on the continent (UNCTAD/UNDP, 2008).

There is division of labour based on gender whereby women are more involved in food crop production and men in cash crop production (Duncan and Brants, 2004). Omwoha (2007) is of the view that the division of labour between men and women is a major constraint to increased women productivity in food crops, particularly when the fact that men specialize in cash crop production leads to a reduction of labour in the production of food crops. However, this contradicts earlier findings such as Von Braun and Webb (1989) as they found more of the labour provided by men was towards food crop production as against the labour of women that is more towards cash or export crop production.

Although domestic chores absorb a large proportion of women's time, they still struggle to do something within their ability to ensure that they get the most out of what they cultivate. The nature of this division of labour is one that constrains development in the sense that gender division of labour is biased (Sikod, 2007). They have come about because of socio-cultural socialization (*Ibid*).

2.5.3 Access to Extension Services and Technology

GIZ (2013_b) defines agricultural extension as the provision of information, training and advice in agricultural production. According to Akpalu (2013), realizing the associated gains in agriculture comes with the need for all the people involved in agricultural production especially rural folks, to have access to productive information on input supply, new technologies; early warning systems for drought, pests and diseases, credit and market prices (*Ibid*).

In addition, it is another way to deal with the impediments that women face in agricultural production. Extension services provide a means for women to learn improved production techniques as well as receiving training and advice. This helps them to organise themselves to improve their access to inputs and markets (GIZ, 2013_b). Proper agricultural extension service delivery could bring transformation in the agricultural sector to ensure the economic growth and poverty reduction that economies seek to achieve in order to be food secured (Akpalu, 2013).

Agricultural extension serves both male and female farmers but some cultural and religious issues pose barriers to the interaction between men and women. According to Ofuoku (2011), the culture in some parts of the world allows only open and limited interaction of female with other people of the opposite sex and this has serious implications for “the acceptance of technological change, dissemination of the results of research to farmers and conveying farmer’s problems back to the research organization.”

According to Cohen and Lemma (2011), extension agents sometimes face problems in advising women farmers, since some local customs may prevent married women from interacting with men other than their husbands. This may constrain the delivery of agricultural extension messages to female farmers, who may be restricted from interacting with male extension agents and those who prefer to interact with female agents (Quisumbing, 1994).

Quisumbing (1994) is of the view that women have not always benefited from extension services. Traditional extension systems based on single-commodity, which mostly are cash crops often fail to consider women's crops and activities. Rural extension may cover many crops and hence will have less attention on one particular crop. Apart from these factors that may limit the benefits women enjoy from extension services, the farmer-extension agent ratio is a very huge limiting factor (*Ibid*).

According to Peterman *et al*, (2010), how to access input is the major challenge that women farmers face and not the propensity to use it. Agricultural extension continues to be vital in the spread of technology and over the years have been more inclined towards participatory approaches and the increase use of communication technologies. Knowledge gap obviously will lead to productivity gap.

Uzokwe and Ufuoku (2005) argue that women are now more involved in traditional men tasks like bush clearing, stumping/stubble burning, tilling and fertilizer application, while their husbands have become less involved. Agricultural extension services should therefore include appreciation and utilization of gender role analysis as an important part of planning, training and recruitment of more female extension agents to enhance adequate information and innovation flow to women farmers.

Saito and Weidemann (1990) argue that, many approaches to the development and dissemination of technology ignores the responsibilities and constraints of women farmers resulting in a highly inefficient use of resources by women and resulting in sub-optimal levels of agricultural production.

The argument by Saito and Weidemann (1990) buttresses the findings of Von Braun and Webb (1989) who concluded that the gender divide is evident in both traditional and modern technologies because most of agricultural innovations designed are not women friendly. Women have average productivity to their labour because most of the time, they have reduced access to labour-saving implements, hence they tend to grow crops that

would not pay off the returns to their labour and time (Von Braun and Webb, 1989). JICA (1999) observes that, “most rural women in Ghana still use the most rudimentary forms of technologies that are both time consuming and labour intensive. This limits their productive capacity and their ability to cultivate large acres of land.”

Gill *et al.*, (2010), reiterate the observation by Von Braun and Webb (1989). They note that, “animal-drawn ploughs, for instance, were developed to pursue men’s work in clearing farmland, and are too heavy for women to push or have handles that women cannot reach; as a result, women continue to use traditional, more labour-intensive methods that undermine their agricultural productivity”.

2.5.4 Access to Credit

The absence of credit has important implications on the ability to undertake productive activities. Okurut *et al.*, (2004) posit that credit is an important instrument for improving the welfare of the poor. This they argued could be achieved directly through consumption by increasing their purchasing power and improving their income sources through financial investment in their human and physical capital to reduce their vulnerability to short-term income.

Access to finance has the capacity to change women positively thereby enabling them to have possession and control over their assets (Zaman, 1999). Access to credit makes it possible for productive activities such as agriculture, which requires more cash for

purchase of land and other inputs in order to be more productive before income gains could be realized.

Fletschner (2008), reports that women with less access to credit produce less than they could possibly do with consequences that are very substantial, an average of 11% loss in efficiency. In the case of agriculture, there is the need for the availability of credit at all stages of the production process (Quisumbing, 1994).

Financial reform programs in many developing countries have not affected positively in terms of improving access to credit by the majority of the rural population who are mostly smallholder farmers of which women form the majority (Mohamed and Temu, 2009). For instance, the removal of agricultural inputs subsidies due to financial reforms has contributed to a large extent, the decline in agricultural production and productivity in the sense that the main victim of these reforms has been the rural population particularly women who depend on agriculture for livelihood (*Ibid*).

Hill and Vigneri (2011) assert that lending credit may base on the lender's perception of the farmers' ability to repay the loan. In this regard, to receive credit, farmers have to prove their ability to produce a marketable surplus, which is in turn associated to the type and size of the land they farm.

The extent to which women have limited access to and control over resources, and with the perception that what they produce is more of the time for home consumption and less for the market, may cause them to have a harder time obtaining credit in this context.

2.5.5 Market Access

Koru and Holden (2008) argue that the limited access to market is a main issue when making gender-based comparisons. The multiplicity of the responsibilities of women in the farm and the household often deny them the opportunity to participate in markets; and thus reduce their involvement in interfacing with input and output markets (Morgan, 2006).

An efficient and responsive marketing system for agricultural products is an important factor for development process (Abbot, 1993). The income and economic welfare of farmers depend on agricultural prices, which in turn influences their farm investment and production decision (Benfica *et al*, 2006). It is therefore important for farmers to have access to markets to have better prices for their produce.

However, Aregu *et al.* (2010) assert that the nature of market engagement differs significantly between women and men. According to Hill and Vigneri (2011), the gender disparity resulting from gender roles between men and women account for the difference in access to assets and markets. This has significant negative effects on the production and marketing of cash crops. “These gender inequalities in resources result in different levels of participation, methods of production and modes of marketing cash crops, and

bear consequences for women's potential outcome in the cultivation of high value crops”
(*Ibid*).

Most of the time, men opt to sell major cash crops in large quantities seasonally and may travel to markets far away for higher prices of their wares due to their financial capabilities (Aregu *et al.*, 2010). In contrast to this development, women most of the time accept prices at local markets that they can easily reach on foot because they cannot afford marketing cost to distant market centres. In such circumstance, women are always more likely to sell directly to local consumers who pay less. The low prices they receive hinder their productivity as women earn less to reinvest in full capacity (*Ibid*). This results in reoccurrence of market inequality which clearly show the fundamentals of inequalities of power (Kabeer, 2012).

This observation is reiterated by Gani and Adeoti (2011) who identified high transportation costs, poor infrastructure and poor market participation as some of the variables that have positive linkages and influences with productivity that subsequently leads to poverty.

Participation in markets stimulates wealth creation among those who can afford amidst production constraints and the costs of market participation. If poor farmers are unable to participate effectively, then it becomes obvious that they get below the market price of the produce they sell at the farm gate and hence cannot reinvest in full capacity to increase productivity.

2.6 Wienco cotton out grower scheme

Wienco Ghana Ltd (WGL) was established in 1979 as a Ghana-Dutch joint venture company involved in businesses in the agricultural sector and is today one of Ghana's leading agribusinesses. Wienco Ghana Ltd is into agricultural commodity trading and support smallholder farmers in out grower schemes (Field Survey, 2014).

As part of Wienco Ghana Limited's commitment to improving productivity of smallholder farmers in Ghana, input packages are given to organized groups of farmers in the form of credit facilities such as fertilizers and agrochemicals and repayment from the farmer groups is done after the harvest of their crops. This helps farmers who may not be financially capable to have access to the needed inputs (Field Survey, 2014).

Where tractor services are provided, the criterion that farmers must meet before their fields are ploughed is that all members in a farmer group are to clear their plots and mark out other obstacles (such as tree stumps that cannot be removed and boulders) that can hinder tractor operations during ploughing.

The company has also been actively involved in supporting the development of the smallholder farming sector in Ghana by training smallholder farmers in input application methods, as well as key aspects of business training through three smallholder farmer associations. These include the Cocoa Abrabopa scheme, the Masara N'Arziki maize association and the smallholder cotton out grower scheme (Field Survey, 2014).

The number of cotton farmers under Wienco's cotton out grower scheme has considerably increased, from 11,000 farmers in 2011/12 to 21,000 farmers in 2012/13, with a corresponding increase in area under cotton cultivation from 7,000 ha to 12,000 ha. In order to reach its objectives, Wienco cotton out grower scheme has developed a network of extension agents (one agent for 100 farmers) to guide farmers in cotton production (Field Survey, 2014; Kanatiah, 2012).

2.7 Empirical Studies on Gender and Productivity

Clark (2013), using OLS to estimate a Cobb-Douglas production function finds that much of the productivity gap between men and women in the agricultural sector is explained by differences in access to vital agricultural inputs, including high quality land and extension services. Additionally, the presence of plots containing multiple crops negatively influenced maize yields and tends to harm productivity more significantly on farms of women than farms managed by men. Using these findings as a basis for policy, he suggests that direct government intervention that expands the scope and availability of extension services, reforms that change land ownership and inheritance rights, and investment in female empowerment programs could reduce gender-based productivity differences further.

Villabon (2012) analyzed gender characteristics and gender differences in agricultural productivity using a cross-sectional household survey data collected in Peru. Estimation of log linear models were aimed at explaining differences in female and male household heads' values of production per hectare, while controlling for socio-economic

characteristics of the household heads, agricultural inputs and regional variations. The study found that there are no effects of sex of the household head itself as well as no effects of sex of the household individuals on plot yield. Furthermore, productivity differences were shown to be attributable to the several inputs male and female household heads used for their agricultural production, which appeared to be influenced by the different characteristics of the regions where the plots were located. Education and mother tongue were shown to be of high importance for agriculture in the Peruvian context. The study suggests that language skills and education become a policy priority for female household heads to increase their productivity.

Thapa (2008) analyzed productivity differentials between men and women in the peasant agriculture in Nepal. Both Cobb-Douglas and translog production functions were estimated using data from the Nepal Living Standard Survey 2003/04. Male-managed farms produce more output per hectare with higher command in market input use, obtaining credit, and receiving agricultural extension services than female managed farms. Sex of household head as proxy for farm manager did not show any difference between male and female managed farms. However, the coefficients of location and household characteristics show significant variations in farm output among ethnic and caste groups residing in different ecological belts of Nepal. The study found that, adult male labour contributed more in production process than adult female labour. Policy needs to focus on the reduction of caste or ethnic disparities as well as regional imbalance in order to minimize disparities in farm productivity between men and women as well as among ethnic and caste groups.

Adeleke *et al.*, (2008), conducted a study on gender and productivity differentials among male and female maize farmers in Oluyele Local Government Area of Oyo State in Nigeria. The study described the socio-economic characteristics of the farmers, analyzed the factors that influence the production of maize and compared the productivity of male and female maize farmers in the study area. The data collected was analysed using descriptive statistics, multiple regressions and the Chow F test to check for the existence of structural stability among male and female maize farmers. The authors observed that there are gender specific differences. These gender specific characteristics did not however affect the productivity of male and female farmers. They found that, women were as productive as men if incentives were granted to everybody who farm maize, there would be an overall increase in the productivity of the households in the study area.

Koru and Holden (2008) explored possible factors that explain gender influences on maize productivity in Uganda. The study used matching estimators and econometric methods to analyse plot level data of households. The results from matching estimators demonstrated that productivity was significantly lower for female-headed households. A bivariate probit model indicated that the probability of adopting fertilizer was higher for male-headed households than female-headed households. Better market access by male-headed households was another factor explaining the productivity difference.

In summary, this chapter reviewed the concept of gender and agricultural productivity. Gender and farm productivity revolves around social and cultural processes especially decision-making on access to resources. From the literature review, women are

marginalised when it comes to issues concerning governance and decision making which have been perpetuated by society making them less productive. However, women do most of the work that the family require to progress both in reproductive and productive terms.

Various factors including access to credit, access to markets, access to extension services and technology among others have positive influence on productivity. However, due to socio-cultural construct of most societies women do not get the benefits of these factors to increase productivity. The literature review also contains empirical evidence on gender and agricultural production and how various researchers have compared productivities of males and females. This dissertation seek to compare the productivities of male and female cotton farmers using the Wienco Cotton out grower scheme where both male and females have equal access to resources except labour.

In estimating factors that influence productivity differentials in cotton production, a Cobb-Douglas production function is used and taking logarithms on both sides of the equation estimate a multiple regression. Gender of the farmer, household head, and the month of plough are dummy variables. Other independent variables include age, household size, labour used on the farm, experience, and multiple farms. The use of separate production functions would not address the critical question of identifying the sources of plot yield differentials (Quisumbing, 2003; Peterman *et al.*, 2010).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in this study. The chapter begins with an introduction followed by a description of the area where the study was undertaken. The rest of the chapter discusses the conceptual framework, method of data analysis, measurement of research variables, sample size and sampling procedure, and sources of data and data collection techniques.

3.2 Description of Study Area

The study area is one of the production zones of Wienco Cotton Limited. It stretches from Saboba through Chereponi to Bunkpurgu Yunyoo Districts all found in the Northern Region. The area forms part of the northeastern corridor of Ghana. All three districts share border to the east with Togo. Due to the location of the area, commercial activities are very vibrant as people cross the border to trade both in Ghana and in Togo. Most of the goods especially motorbikes found in the northern part of the country enter through this area. The main occupation in this area is farming with cotton and Shea nuts as the major cash crops (Kanatiah, 2012).

The climate of the area is relatively dry, with a single rainy season that begins in May and ends in October. The amount of rainfall recorded annually varies between 900 mm and 12000 mm. Rainfalls are characterized occasionally by heavy thunderstorms, and floods occur at the peak period of July to September. The humidity generally is high during this

season; temperatures are generally high all year round and the highest temperature recorded in March. Average monthly temperature is about 25.50° C (Ghana Statistical Service, 2014).

The dry season starts in November and ends in March/April with maximum temperatures occurring towards the end of the dry season (March-April) and minimum temperatures in December and January. The harmattan winds, which occur during the months of December to early February, have considerable effect on the temperatures in the area. Humidity is very low and mitigates the effect of the daytime heat. The area is much drier than southern areas of Ghana, due to its proximity to the Sahel, and the Sahara. The main vegetation is classified as vast areas of grassland, interspersed with the guinea savannah woodland, characterized by drought-resistant trees such as the acacia, baobab, Shea nut, dawadawa, mango, neem (Ghana Statistical Service, 2014).

The Voltarian shale underlies the area, which is normally suitable for rural water supply - boreholes. From literature, most of the soils in the interior savannah and the transitional zones developed over shale, which contains abundant iron concretions and iron pan in their sub-soils. There is water logging at the peak of the rains, due to impervious iron pan or clay pan in the sub-soil. The topography of the area is undulating with few hills, which provide a good flow for run-off water. The soils are good along valleys (Ghana Statistical Service, 2014).

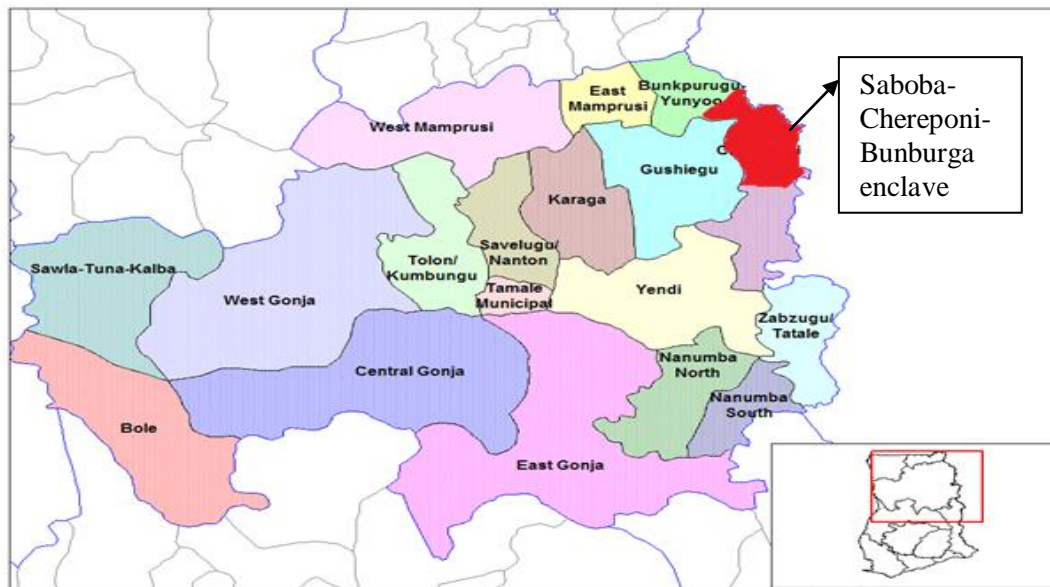


Figure 2 A map of the Northern Region of Ghana showing the Districts. The shaded region in red indicates the study area. Source: Wikipedia, 2013

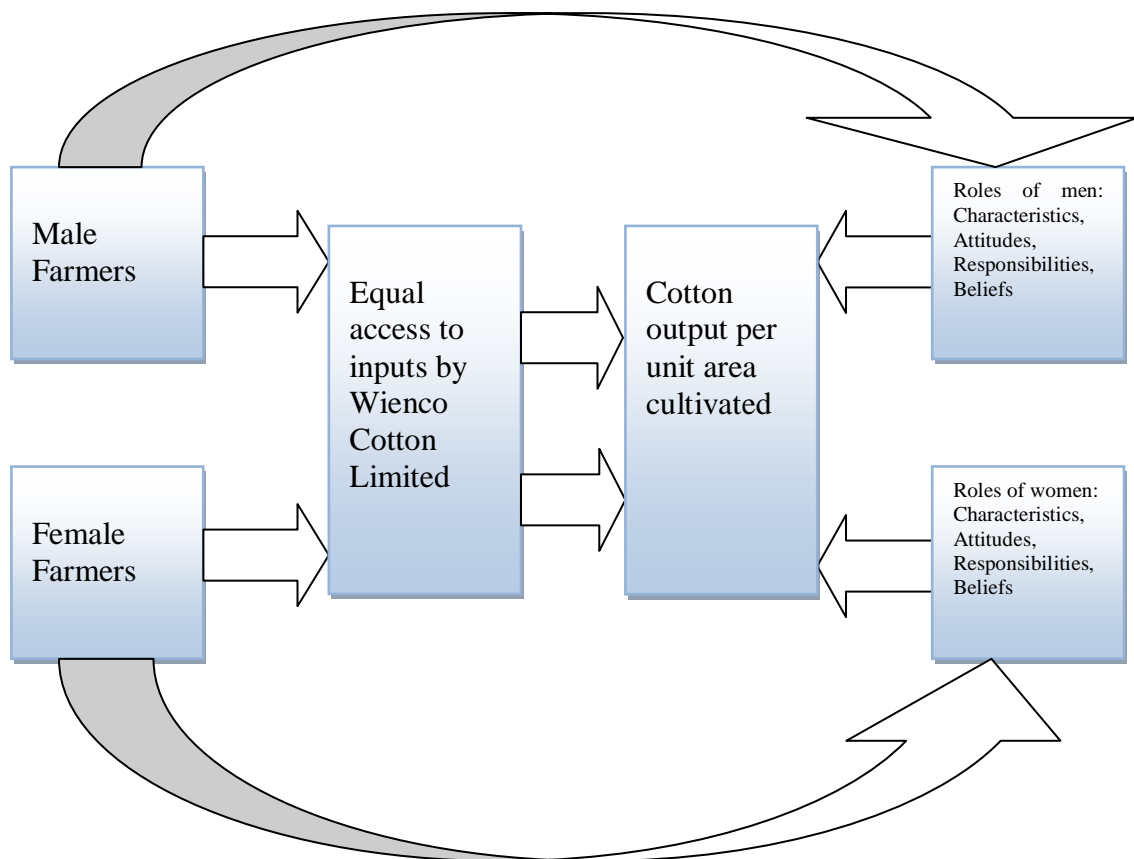
3.3 Conceptual Framework

This study seeks to find out whether there is a productivity difference between male and female cotton farmers in cotton production in the Northern Region of Ghana. Several studies on gender and productivity in developing countries have found that in terms of agricultural output, women produce less than men do (Horrell and Krishnan 2006, Clark, 2013). However, other studies such as Ragasa *et al.*, (2012) and Hill and Vigneri (2011) find contrary results.

Generally, in agriculture the quality and quantity of inputs has a significant effect on the level of output. Figure 3 shows that male and female cotton farmers get equal access to inputs for cotton production from Wienco Cotton Limited to produce cotton on large scale for export. All farmers involved in the out grower scheme are given equal access to

same inputs including fertilizer, seed, insecticides, weedicides, tractor and extension services. However, there is the need to account for the differences in the roles of males and females to be able to compare any productivity differences between them in agricultural production.

Figure 3 Conceptual Framework of how gender roles influence cotton productivity



Source: Author's construct

The key question therefore is whether a woman growing cotton on a piece of land with a specific amount of inputs will obtain a level of output equal to that of a man growing cotton with the same levels of inputs? In other words, are there any differences in gender roles between men and women that lead to differing levels of output, holding land and availability of inputs constant?

It is expected that the level of output from men and women would not be the same; men will perform better in terms of productivity than women. This is based on the assumption that women may have access to exhausted farmlands that will contribute no nutrients more than what has been applied as fertilizer to crops. In Northern Ghana, when women engage in agriculture, they are usually constrained to less fertile lands offered by the families of their husbands or fathers (Bambang and Abubakari, 2013). Women also have the task of doing all household chores as well as helping to do their husbands farm work before they can attend to their own farms.

3.4 Method of Data Analysis

This section describes the model specifications by which various objectives of the study are achieved.

3.4.1 Objective One: (Describe the nature of resource endowments of male and female cotton farmers).

Data for this study was collected from farmers using structured questionnaires. The survey used proportionality test to determine the significance in the difference of the

proportions between the two research units – male and female cotton farmers. Based on the literature survey (Barbier, 2003), the following are resources considered for the study; age of farmers, farm experience, farm size, labour, multiple farms, household size and household head.

3.4.2 Objective Two: (Estimate the productivity differentials between male and female cotton farmers).

To estimate the land productivity differential between male and female cotton farmer in the study area, data on yield of seed cotton was collected and analyzed. Following Dicta *et al.*, (2013), the Z test was used in testing for the significance in the difference of the mean land productivities of male and female cotton farmers.

$$Z = \frac{(\overline{U_1} - \overline{U_2})}{\sqrt{\frac{\alpha_1^2}{n_1} + \frac{\alpha_2^2}{n_2}}} \quad (3)$$

Where;

$\overline{U_1}$ = mean productivity of male cotton farmers

$\overline{U_2}$ = mean productivity of female cotton farmers

α_1^2 = Variance of male cotton farmers

α_2^2 = Variance of female cotton farmers

n_1 = Number of male cotton farmers

n_2 = Number of female cotton farmers

H₀: $\overline{U}_1 = \overline{U}_2$ the mean productivity of males is equal to the mean productivity of females when they both have equal access to same inputs.

H_a: $\overline{U}_1 > \overline{U}_2$ the mean productivity of males is more than the mean productivity of females when they have equal access to same inputs.

The hypothesis is specified as:

$$\text{H}_0: \overline{U}_1 = \overline{U}_2$$

$$\text{H}_a: \overline{U}_1 > \overline{U}_2$$

Decision Rule: We accept that there is a significant difference in mean productivity level among gender if the calculated Z is greater than the critical Z. We reject the null hypothesis in favour of the alternative hypothesis.

3.4.3 Objective Three: (Empirically estimate factors that affect productivity differentials in cotton production).

Following Peterman *et al.*, (2010), a Cobb-Douglas production function was used to estimate the factors that influence the productivity differentials in cotton production. The general form of the Cobb-Douglas production function used is specified as:

$$\ln Y = \beta_0 + \beta_1 \text{Gender} + \beta_2 \ln \text{Age} + \beta_3 \ln \text{HHSize} + \beta_4 \text{HHead} + \beta_5 \ln \text{Lab} + \beta_6 \ln \text{MultFarms} + \beta_7 \ln \text{Exprnce} + \beta_8 \text{TimPlou} + \varepsilon \quad (4)$$

Y = Land Productivity (kg/ha)

Gender = gender of farmer (Dummy)

Age = age of the farmer (years)

HHSize = household size of farmer (number of dependants)

HHead = Household Head (dummy taking 1 and 0 if otherwise)

Lab = Labour (man-days)

Exprnce = Experience in cotton production (years)

MultFarm = Number of farms in addition to cotton farm

MontPlou = Month of plough (May, June and July). These are measured as dummy variables, taking 1 and 0 if otherwise.

β_0 = the constant term

β_1 to β_8 = Coefficients to be estimated

ϵ = the error term.

H₀ = men are not more productive than women are if they both have equal access to same inputs.

H_a = men are more productive than women are if they both have equal access to same inputs.

The hypothesis is specified as:

$$H_0: \beta_1 = 0$$

$$H_a: \beta_1 \neq 0 (\beta_1 > 0)$$

Decision Rule: We reject the null hypothesis in favour of the alternative hypothesis if β_1 , the coefficient of gender is greater than zero.

The partial factor productivity of farmers is determined by the ratio of output of the farmer to the farm size in hectares:

$$\text{Land Productivity (Y)} = \frac{Q_i}{X_i} \quad (5)$$

Where: Q_i = Output of cotton (Kg)

X_i = Land Size Cultivated (Hectares)

3.5 Measurement of Variables and A prior Expectations

Productivity: Productivity of farmer is the output of seed cotton produced divided by the farm size on which cotton was cultivated in the 2013 cropping season. It is expressed in kilograms per acre. It is expected that productivity given all the necessary inputs for cotton cultivation will be high.

Age of the farmer: It is a continuous variable, defined as the farmer's age at the time of interview measured in years. It is hypothesized that younger farmers may be more advantaged energy wise since cotton farming is laborious. It is expected that productivity increase with age but decreases after a certain threshold.

Gender: Gender of the farmer is the main independent variable of interest. It is a dummy variable with a value of 0 if the farmer is female and 1 if male. The expectation is that male cotton farmers will have better productivity in cotton than females considering the

core function of males, which primarily is to do farm work. Females do the household chores, play the role of caretakers of children, and help in doing farm work of husbands.

Household Size: This variable refers to the number of people living within the household of the farmer. It describes how much labour is available to the farmer. More accessibility to labour available will lead to higher productivity.

Household Head: This variable refers to the head of the entire household. Household head is a dummy variable that takes 1 if the farmer is and 0 if not. The responsibility of a male household head according to the socio-cultural construct of the area is primarily farm work. However, women household heads have the additional task of fetching water and firewood, child rearing and cooking among others that that may hinder them from giving their cotton farms the full attention it deserves. It is expected that the effect of being a household head by males will contribute more to their productivity levels than females.

Labour: This refers to the number of man days of labour used on the farm from planting to harvesting irrespective of the source. The more labour used on the farm, the better the chance of attaining higher returns all things being equal.

Multiple Farms: This refers to the number of farms a farmer owns in addition to cotton farm. The hypothesis is that if a farmer has more farms, there would be a strain on labour available and less labour input will be available on the cotton farm. This would have negative influence on productivity.

Experience of farmer in cotton production: This refers to the number of years a farmer has been into cotton production. Over the years many cotton out grower schemes have been introduced in the area. The frequency at which a farmer has been involved in various out grower schemes determines how specialized the person is in terms of the knowhow regarding cotton. The longer a farmer is exposed to cotton production, the higher the productivity levels all things being equal.

Month of plough: This identifies the time the farmer had his or her land ploughed for cotton production. The rainfall starts in May. The hypothesis is that farmers who will have their lands ploughed on time (at the onset of the rains) will have adequate rainfall for their cotton than those who have their lands ploughed later (June and July). This assumption is based on the rainfall pattern in the Northern region. The month of plough is a dummy variable taking 1 if farmer had his/her land ploughed in that month and 0 if otherwise.

Wienco Cotton Limited, the tractor service provider for farmers under the cotton production scheme, does not plough land for farmers on gender basis. However, they issue orders for land to be ploughed for farmer groups (usually within the same

community) if all members of the group have cleared their plots of tree stumps and mark out spots where other obstacles (such as tree stumps that cannot be removed and boulders) that can hinder tractor operations during ploughing. The time a farmer will have his/her field ploughed will depend on how early all the other members of the group he/she belongs to meet this criteria.

Table3. 1 Measurement of Variables and A Prior Expectation

VARIABLES	UNIT OF MEASUREMENT	A PRIOR EXPECTATION
Productivity	Kg/acre	
Gender	Dummy Male is 1 Female is 0	+/-
Age	Years	+
Household size	Number of occupants	+
Household Head	Dummy If Male 1, otherwise 0 If Female 1, otherwise 0	+
Labour Used	Man days	+
Multiple Farms	Farms in addition to cotton farm	+/-
Experience	Years	+
Month of Plough	Dummy If May 1, otherwise 0 If June 1, otherwise 0 If July 1, otherwise 0	+/-

3.6 Sample Size and Sampling Procedure

A sample size of 200 was used (120 male and 80 female cotton farmers) based on a formula proposed by Calderon (2003), specified as;

$$n = \frac{N}{(1+Ne^2)} \dots\dots\dots (6)$$

Where n is the sample size, N is the population size of farmers and e is the margin of error (5%). The Saboba-Chereponi-Bunburga enclave of the Wienco Cotton production zone in the Northern Region of Ghana was purposively sampled for the study. Ten Cotton Production Assistants (CPA's) from this cotton production zone were sampled using the lottery sampling technique out of thirteen and contacted for the list of farmers. Each CPA has a coverage area within the production zone where he operates. On a ratio of 6 men: 4 women due to the number of women farmers, the lottery sampling technique was then used to select 20 farmers from each area to make sure that the 200 sample size is spread across the ten selected coverage areas. In all 120 men and 80 women were selected.

Table3. 2 Numbers of Farmers in Selected Coverage Areas and Number Selected

Coverage Area	Male Farmers	Female Farmers	Total	Farmers Selected
Nambiri	81	10	91	20
Nabruku	89	9	98	20
Nabrunu	85	12	97	20
Ogando	83	9	92	20
Tombo	90	15	105	20
Achuma	83	11	94	20
Shirabu	91	13	104	20
Fumisa	82	17	99	20
Nansoni	85	13	98	20
Nagbacheri	87	8	95	20
Total	856	117	973	200

Source: Field survey, 2014

3.7 Sources of Data and Data Collection Techniques

Cross sectional data were collected using a structured questionnaire for socio-economic and farm level data from 200 smallholder male and female cotton farmers. Farmers were drawn from the Saboba-Chereponi-Bunburga enclave of the Wienco cotton production zone in the Northern Region of Ghana. Data collected included information on demographics and farm specific activities on input use. Data on the yield of farmers and farm size were taken from the Farmer's Marketing Chit given to farmers by Cotton Production Assistants (CPA's) after seed cotton was purchased.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the gender characteristics of farmers that influence productivity of cotton in the Saboba-Chereponi-Bunburga enclave of the Wienco Cotton production zone in the Northern Region of Ghana. The chapter also presents comparison of mean productivities of male and female cotton farmers, gender difference in input use, and the factors that influence land productivity differentials in cotton production. The results are discussed within the socio-cultural context of gender roles of the area.

4.2 Gender Characteristics of Cotton Farmers

This section elaborates some important socio-economic and socio-cultural characteristics of male and female cotton farmers in the study area.

Age: Table 4.1 shows that the majority of the farmers interviewed are within the age bracket 31 to 45 years. This implies that there is an even distribution of male and female cotton farmers in the economically active age bracket. In all the age brackets, there are significant differences in the mean productivities of male and female cotton farmers. As expected, age increases with productivity and decreases after a certain threshold as the energy input of farmers decline with age.

Table 4. 1 Frequency Distribution of Age Respondents

Age (Years)	Male		Female		Z Score	P values
	Frequency	Mean Productivities	Frequency	Mean Productivities		
19 - 30	20	180.2835	6	147.0733	2.5051	0.0122**
31 - 45	51	339.0475	40	172.9345	4.2822	0.0001***
46 - 60	37	362.0881	34	197.7624	4.9942	0.0001***
Above 60	12	256.3769				
Total	120		80			

P-values are test of significant differences between means productivities of males and females.

** and *** indicates significance at 5 % and 1% respectively.

Source: Field survey, 2014

Mode of fertilizer application: From table 4.2, most of the farmers interviewed (both male and female) used the side placement mode of fertilizer application. However, there are no significant differences in between the proportions of the two research units, male and female cotton farmers in the use of any of the two methods. Ideally, it would be best for farmers to bury fertilizer very close to the plant. However, this practice is labour intensive; it has many advantages than the other method as it reduces the impact of the weather on the exposed fertilizer.

Table 4. 2 Frequency Distribution of the Methods of Fertilizer Application

Method	Male		Female		Z Score	P values
	Frequency	Percentage	Frequency	Percentage		
Side Placement	78	65.00	59	73.50	1.3	0.2053
Burying	42	35.00	21	26.50	1.3	0.1919
Total	120	100	80	100		

P-values are test of significant differences between proportions of males and females in each method of fertilizer application. None of the P-values estimated is statistically significant.

Source: Field survey, 2014

Experience: Table 4.3 indicates that majority of the female respondents have more years of farming experience of 11 years to 20 years in cotton production than the males. They constitute 61.25% compared to 54.2% of males. However, there is an even distribution in the years of farming experience in cotton production as the difference in the mean years of farming experience of male and female farmers are not significantly different from each other.

Table 4. 3 Frequency Distribution of Years of Farming Experience of Respondents

Farm Experience	Male		Female		Z Score	P values
	Frequency	Percentage Mean	Frequency	Percentage Mean		
1 - 10	35	29.17	23	28.75	0.1	0.9489
11 - 20	65	54.17	49	61.25	1.0	0.3218
21 - 30	13	10.83	8	10.00	0.2	0.8512
Above 30	7	5.83	0	0.00		
	14		13		0.7	0.47
Total	120	100	80	100		

P-values are test of significant differences between proportions of males and females. None of the P-values estimated is statistically significant.

Source: Field survey, 2014.

In West African countries, cotton production is done on smallholder farms as a cash crop in rotation with staple crops (Hussein, 2008). Women play an important role by contributing a large portion of the labour force by helping in farm activities such as planting and weeding since they do not have access to inputs to engage in cotton production themselves (*Ibid*).

Land Acquisition: From table 4.4 men have more control over land than women do. All the women respondents borrowed the land on which they farm from their husbands. The men owned the land by inheritance.

Table 4. 4 Frequency Distribution Means of Land Acquisition

Land Acquisition	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Inherited	116	96.67	0	0
Borrowed	4	3.3	80	100
Leased	0	0	0	0
Total	120	100	80	100

Source: Field survey, 2014.

In Northern Ghana, women do not own land and even if a man dies, his eldest son or another male from within the clan takes control of the land the deceased controlled before (Field survey, 2014; Adolwine and Dudima, 2010). Men have greater control over land than women do, a situation strongly influenced by land ownership rights defined by custom (Duncan and Brants, 2004). In Northern Ghana, control over land generally follows a gender-segregated pattern based on traditional norms, which limit the land rights of women resulting in land being concentrated in the hands of men to the exclusion of women (Adolwine and Dudima, 2010).

Multiple Farms: More women farm one to three farms in addition to cotton farm. Men however dominate when it comes to having four to six farms in addition to cotton farm with significance in mean at 1% level. This again reinforces the observation that men have more control over land ownership than females.

Table 4. 5 Frequency Distribution of Multiple Farms in addition to Cotton

Multiple Farms	Male			Female			Z Score	P values
	Frequency	Percentage	Mean	Frequency	Percentage	Mean		
1 - 3	51	42.50		53	66.25		3.3	0.0001***
4 - 6	68	56.67		27	33.75		3.2	0.0015***
Above 7	1	0.83		0	0		0.8	
Total	120	100	2.88	80	100	2.5	2.8	0.0045***

P-values are test of significant differences between proportions of males and females.

*** indicates significance 1%.

Source: Field survey, 2014

Labour: Table 4.6 shows the various ranges of total numbers of man-days used by famers. The table indicates that majority of the sampled farmers used between 12 man-days to 20 man-days of labour on their farms but a greater proportion of these are women. Higher labour input (21man-days to 30 man-days) is associated with men. Overall, the mean labour supplies of male and female cotton farmers are significantly different at 1% level.

Table 4. 6 Frequency Distribution of Labour Used by Respondents

Labour (Man-days)	Male			Female			Z score	P values
	Frequency	Percentage	Mean	Frequency	Percentage	Mean		
12 - 20	88	73.33		69	86.25		2.2	0.0293**
21 - 30	31	25.83		11	13.75		2.1	0.0399**
Above 30	1	0.83		0	0		0.8	0.4140
Total	120	100	18.9	80	100	17.6	3.1	0.0014***

P-values are test of significant differences between proportions and mean man-days of males and females labour input.

, and * indicates significance at 5% and 1% respectively.

Source: Field survey, 2014

In Northern Ghana, women have little or no control over the labour in the family; it is the husbands who have the authority instead (Bambang and Abubakari, 2013). In addition, the husbands may also call on women as family labour. This constrain women in terms of

labour for their own productive activities, therefore their inability to expand their enterprises to increase productivity (Ellis *et al.*, 2006). However, due to the poverty situation in Northern Ghana, women rely on their own labour input for their farm work (see table 4.10). According to the Ghana Statistical Service 2013 report on poverty, the Northern Region was ranked the poorest using a Multi-dimensional Poverty Index. About 74.6% of the total households in the region cannot access proper housing, education, health, water, and sanitation among others. About 72% of households are in the rural areas of the region.

Month of plough: The time for ploughing fields of farmers, starts in early May until the time the last farmer in the scheme will have his /her field ploughed. Most of the respondents had their fields ploughed in May and June with the majority occurring in June. However, there are no significant differences between the proportions of male and female cotton farmers who had their fields ploughed in the month of May and June. A few males had their fields ploughed in July.

Table 4. 7 Frequency Distribution of the Month of Plough of Farmer's Fields

Month of Plough	Male		Female		Z score	P values
	Frequency	Percentage	Frequency	Percentage		
May	42	35.00	27	33.75	0.2	0.8564
June	67	55.83	53	64.25	1.1	0.2646
July	11	9.17	0	0		
Total	120	100	80	100		

P-values are test of significant differences between proportions of males and females. None of the P-values estimated is statistically significant.

Source: Field survey, 2014.

The practice according to Wienco Cotton Company is that all members in a group are to clear their plots of tree stumps and mark out other obstacles (such as tree stumps that cannot be removed and boulders) that can hinder tractor operations during ploughing. All group members are to meet this criterion before they inform the Cotton Production Assistant in charge who then inspects and then call in a tractor (Field Survey, 2014). Not meeting this criterion on time will delay the time of ploughing.

Household Size: Majority of households have between six to ten occupants. From table 4.8, 45.83% of males and 40% of females have household sizes within this range. However, there is no significant difference between the proportion of male and female cotton farmers who have household size in this category. The mean household size of males is not significantly different from the mean household size of females, implying that labour supply is evenly distributed among male and female cotton farmers. However, labour accessibility favours men more than women in the study area.

Table 4. 8 Frequency Distribution of Household Sizes of Respondents

Household Size	Male			Female			Z score	P values
	Frequency	Percentage	Mean	Frequency	Percentage	Mean		
1 - 5	26	21.67		17	21.25		0.1	0.9435
6 - 10	55	45.83		32	40		0.8	0.4152
11 - 15	36	30		28	35		0.7	0.4577
16 - 20	3	2.5		3	3.75		0.5	0.6117
Total	120	100	8	80	100	8	0.5	0.58

P-values are test of significant differences between proportions of males and females. None of the P-values estimated is statistically significant.

Source: Field survey, 2014

Household Head: Table 4.9 shows that the majority of female respondents are not household heads. They constitute 65% of the total number of female respondents against 3.33% of male respondents who are not heads of households.

Table 4. 9 Frequency Distribution of Household Head Status among Gender

Household Head	Male		Female		Z score	P values
	Frequency	Percentage	Frequency	Percentage		
Yes	116	96.67	28	35	9.5	0.000 ***
No	4	3.33	52	65		
Total	120	100	80	100		

P-values are test of significant differences between proportions of males and females.

*** indicates significance at 1%.

Source: Field survey, 2014.

There is a significant difference in the proportion of male and female cotton farmers who are household heads and those who are not. Women who engage in paid work often face a double workday, since they will have to make sure that their domestic duties are still fulfilled, meaning women are time poor and the time burden, a situation, which may affect their productivity (Bradshaw *et al.*, 2013).

Source of labour used: Table 4.10 shows the source of the labour that famers used. Male cotton farmers relied largely on family labour for cotton production while females used their own labour. This implies that husbands may call upon women as part of the family labour to help in carrying out their (men) farm activities in addition to reproductive responsibilities.

Table 4. 10 Frequency Distribution of the Source of Labour Used among Gender

Labour Source	Male		Female		Z score	P values
	Frequency	Percentage	Frequency	Percentage		
Hired	1	0.8	0	0		
Family	114	95	3	3.75	12.8	0.0001***
Own	5	4.2	77	96.25	13.0	0.0001***
Total	120	100	80	100		

P-values are test of significant differences between proportions of males and females.

*** indicates significance at 1%.

Source: Field survey, 2014.

By the gender role specification, males have better access to family labour than females as they dominate in decision making on resource use within the household (Bambang and Abubakari, 2013; Aregu *et al.*, 2010).

Output: The table 4.11 indicates that the majority of women, 71.25% had less than 500kg output of seed cotton as compared to 47.5% of men. However, 28.33% of the men had between 601kg and 1000kg output of seed cotton. Over all, there is a statistically significant difference (1%) in mean outputs. This implies that the difference in land area cultivated and the characteristics, attitudes, responsibilities and beliefs associated with women based on gender roles have significant negative effects on productivities of women.

Table 4. 11 Output Distributions of Respondents

Output (kg)	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Below 500	57	47.5	57	71.25
500 – 600	19	15.83	19	23.75
601 - 1000	34	28.33	4	5
Above 1000	10	8.33	0	0
Total	120	100	80	100
Mean value			Z Score	P Value
Female	418.17		4.31	0.0001***
Male	562.37			

P-value is test of significant differences between the mean outputs of males and females.

*** indicates significance at 1%.

Source: Field survey, 2014.

4.3 Comparing Mean Land Productivities of Male and Female Cotton Farmers

Following Dicta *et al.*, (2013), the Z test was used to estimate the significance in land productivity differences of male and female cotton farmers. Women made up 40% of the sample while men constituted the remaining 60%. The mean productivities of male and female cotton farmers are 310.54kg/ha and 181.55kg/ha respectively.

The gap in productivity indicates that holding all other factors constant, male cotton farmers can produce 128.99kg more seed cotton per hectare of land than female cotton farmers representing 71.06 % difference in productivity.

Table 4. 12 Comparing the Mean Land Productivities of Male and Female Farmers

	Gender	
	Male	Female
Mean productivity (kg/ha)	310.54	181.55
Observations	120	80
Hypothesized mean difference	0	
Z _{cal}	3.8969	
Z _{crit}	1.96	
P Value	0.0001***	

P-value is test of significant differences between mean productivity of males and females.

*** indicates significance at 1%.

Source: Field survey, 2014.

These results are consistent with findings in other developing countries in Africa such as Ogunniyi *et al.*, (2012), Horrell and Krishna (2006). Ogunniyi *et al.*,(2012) observed a 52.77% productivity differential among male and female cocoa farmers in the in Ile Oluji Local Government Area of Ondo State, Nigeria. Female farmers had lower productivity than their male counterparts did.

4.4 Factors Influencing Land Productivity Differentials

This analysis uses the ordinary least square regression to investigate the effects of socio-economic characteristics on land productivity of male and female cotton farmers. The focus is whether the gender coefficient is significant, indicating the presence of a productivity gap between male and female. The result of the regression is presented in table 4.13. The R^2 value is 0.2104 meaning that the explanatory variables in the model explain 21.04% of the variation of the value of land productivity.

However, the data analyzed is a cross-sectional data, which sometimes can have significantly lower R^2 values. Reisinger (1997) justifies this by arguing that unexplained variations that cannot be averaged out as in time-series data are included in cross-sectional data analysis. Nonetheless, R^2 values is no absolute indicator of goodness of fit nut a relative measure that explains variance relative to total variance in the dependant variable (*Ibid*).

The statistically significant explanatory variables were gender, household size, labour used, ploughing in the months of May and June and the cross-sectional terms of gender and multiple farms. These were significant at 1% and 5% significant levels. From the estimated coefficients, the explanatory variables had the expected signs except multiple farms.

Table 4. 13 Factors Influencing Land Productivity Differentials

Variables	Coefficient	Standard Error	t statistics	P value
Constant	4.360503	0.7079706	6.16	0.000
<i>Socio-economic characteristics</i>				
Gender	0.3891946***	0.1374212	2.83	0.005
Farm Experience (LogExprnce)	0.0390268	0.0591564	0.66	0.510
Age of Farmer (LogAge)	0.0439693	0.1757268	0.25	0.803
<i>Farmer Attitude</i>				
Labour Used (LogLabUsed)	0.5082812***	0.1511388	3.36	0.001
Multiple crops (LogMultFarm)	0.1014015	0.1025456	0.99	0.324
Ploughing in May (MontMay)	0.3197427**	0.1252219	2.55	0.011
Ploughing in June (MontJune)	0.2641299**	0.1206692	2.19	0.030
<i>Farmer Responsibilities</i>				
Household Head (FemHHHead)	-0.0442985	0.0880943	-0.5	0.616
Household Size (LogHHSIZE)	0.148521**	0.0581065	2.56	0.011
<i>Interaction Terms</i>				
Gender*MultFarms	-0.288697**	0.1385748	-2.08	0.039
Number of observations	200			
F Statistic	5.04			
Prob > F				0.000
R-squared	21.04			

** , and *** indicates significance at 5% and 1% respectively.

Source: Field survey, 2014

The gender variable is significant at 1% level with a positive sign. The inference is that male cotton farmers have relatively higher productivities than female cotton farmers do.

The average land productivity of males is 38.91% more than females assuming all things

are constant. This result compares to other studies such as Clark (2013) where productivity difference was observed among male and female maize farmers in Malawi. Horrell and Krishna (2006) had similar findings among farmers in cotton production in Zimbabwe.

Household size has positive and significant effect on land productivity. There is a 14.85% increase in land productivity due to increase in household size (Table 4.13). This implies that accessible labour increases as household size increases.

Coefficient of the labour used on the farm is positive and statistically significant at 1% level. The more man-days used on the farm, the higher the output obtainable all things being equal. There is a 50.82% increase in productivity due to labour. However, labour accessibility is more inclined towards males than females. The survey indicates that majority of the male respondents (95%) used family labour for farm work whilst majority of women (96.25%) relied on their own labour supply for farm work.

The coefficients of ploughing in the months of May and June are statistically significant at 5% level and have positive influence on productivity (Table 4.13). There is a 31.97% increase in productivity due to ploughing of fields in the month of May relative to 26.41% increase in productivity due to ploughing in the month of June. This implies that it is ideal to plough the fields of farmers at the beginning of the rainy season. The cotton plant takes a minimum of six months after planting to reach harvesting stage (USDA, 1997). The Northern Region of Ghana experiences one rainfall season that starts in

April/May and ends in October and therefore timely sowing is an important criterion for achieving high cotton yields. However, by socio-cultural construct of gender roles women do planting of both staple crops and cotton (Field survey, 2014, Hussein, 2008). When planting time of cotton and the staples coincide (which is usually the case as plots for both staples and cotton are prepared when the rains start), women have to first plant for their husbands first (Field Survey, 2014). As a result, planting time of cotton for women is delayed considering the numerous crops the males cultivate in addition to cotton.

The effect of the interaction variable of gender and owing multiple farms favoured women more than men in terms of increase in productivity by 28.85% and it is significant at 5% level. Most of the women respondents have at most three farms in addition to cotton farm whilst most men have as much as six different farms in addition to cotton farm.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the study, draws conclusions from the findings and suggests recommendations relevant to improving women productivity in cotton production.

5.2 Summary

This study sought to assess productivity differentials that are often seen in the agricultural sectors of developing countries from the gender perspective. The northern region of Ghana served as the setting for this study due its relatively low level of economic development and the different gender participation rates in agriculture especially in cotton production. Cotton companies operating in Northern Ghana provide services including fertilizer, cottonseeds, weedicides, pesticides, extension and tractor services. These services are provided to men and women so long as they have land to engage in cotton production. The farmers receive their inputs on credit and pay back upon delivery of seed cotton at the end of the production season. Farmers form groups and act as out growers.

The land productivity of farmers was estimated using cross-sectional data collected from 200 cotton farmers (120 males and 80 females) in the Saboba-Chereponi-Bunburga enclave of Wienco cotton production zone. Data was collected on socio-economic and demographic variables such as age, experience, gender, household size, multiple crops,

and means of land acquisition. Data was also collected on farm characteristics such as farm size, and yield. Statistical tests were conducted on the difference in land productivities between male and female cotton farmers. A Cobb-Douglas production function was used to estimate the factors that influence land productivity differentials of cotton farmers.

Findings from the socio-economic and socio-cultural characteristics of cotton farmers showed that, there was no significant difference in the proportion of males and females concerning the month of plough as well as the method of fertilizer application. However, there is a gender differential in the use of own labour and family labour on the farms. Women are constrained due to their reproductive roles including child upbringing and by gender role specifications, can be called on as family labour by their spouses.

The results showed that gender, labour used on the farm, household size, ploughing in the months of May and June when the rains are starting and having less multiple farms in addition to cotton farm have influence on the productivity of cotton farmers.

5.3 Finding and Conclusions

The following conclusions are drawn from the study:

- i. There is no significant difference in the mean years of farming experience of male and female farmers. This implies that the farmers irrespective of gender have all acquired the necessary experience in cotton production that can positively affect the production process and adoption of new technologies.

- ii. Male cotton farmers rely relatively more on family labour for cotton production compared to females who use their own labour. This accounts for the high average family labour supply of males than females with a statistically significant difference. Women may be called on as part of the family labour to help in productive activities such as planting, weeding and harvesting, which reduce their labour input on their own farms.
- iii. The gender variable is statistically significant with a positive sign implying that the difference in the average land productivity between males and females is significant. Gender roles and relationships influence the use of resources. Reproductive responsibilities such as child bearing and child upbringing make women spend less of their time on productive activities such as agriculture (Sikod, 2007). The additional work burden limits women's capacity to engage in productive activities that often require a minimum fixed time before being profitable (Seebens, 2010).
- iv. The labour used on the farm contributes positively and largely to productivity than any other variable. This implies that holding inputs and other resources constant, labour input is key in determining productivity by the magnitude of its impact and significance.
- v. Household size has positive and significant effect on land productivity implying that if household labour were devoted mostly to agricultural production, there would be productivity increase.

- vi. Ploughing the field for cotton production in the months of May and June has positive and significant influences on land productivity. Ploughing in May has a higher marginal effect on land productivity. The rainfall usually starts in May in the Northern Region. This implies that the time of ploughing the field impacts on productivity of farmers with respect to the rainfall pattern in the Northern Region and the maturity period of cotton plants.
- vii. Working on fewer multiple farms in addition to cotton farm has a significant positive impact on productivity of women who had fewer multiple farms in addition to cotton farm as compared to men. The implication is that if a farmer owns more farms, there is a strain on labour available, as different farms have different labour requirements, affecting labour input on cotton farm.
- viii. The productivity gap between male and female is about 71.06% and there is the need to bridge this gap for economic growth.

5.4 Policy Recommendations

Gender inequalities arising from the roles of males and females constrain women in agriculture development especially in access to land and labour and should be given attention. It would therefore be important for sensitization on the need for cultural change to shift the paradigm in the conventional stereotype roles, responsibilities, and tasks of women and men that are deeply rooted in culture to reduce the gender bias especially in

agriculture. This should be spearheaded by institutions such as the Ministry of Gender, Children and Social Protection (MGCSP) and supported by other gender advocacy institutions.

- i. From the study, labour is a significant resource that contributes largely to productivity in cotton production. The study however showed that women are constrained in terms of access to labour. Therefore, cotton companies should help women overcome the problem of limited access to labour by helping them with finances to enable them hire labour for their cotton plots.
- ii. The study indicates that fields ploughed only at the beginning of the rainy season for cotton production had higher productivity than fields ploughed in later months. Cotton companies should educate farmers to meet the criterion for the tractor service on time (before the rains start) in order to have their fields ploughed at the beginning of the rainy season. This would also allow women to observe their obligations to their husbands (such as planting) early and have ample time to plant their own in order for their cotton to get adequate rainfall.
- iii. The study also indicates that having fewer farms in addition to cotton farm have positive impacts on cotton productivity. Through the Competitive African Cotton Initiative (COMPACI), farmers should be educated on the need to focus on a few farms to be able to increase productivity of both staples and cotton. COMPACI is an initiative of the German Federal Ministry for Economic Cooperation and

Development in partnership with cotton companies in Africa. It is aimed at educating farmers to see farming as a business by giving them technical assistance on farming and farming related issues to improve upon their productivity both in cotton and food crop production.

REFERENCES

- Abbot, J. C. (1993). Marketing the rural poor and sustainability. In: JC Abbot (Ed.): *Agricultural and Food Marketing in Developing Countries. Selected Readings* Wallingford: CTA/CAB International, U.K., P. 2.
- Adeleke, O. A., Adesiyun, 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 in Oyo State. *Agricultural Journal*, vol. 3 (3):pp. 193 – 198.
- Adesina, A. A. & K. K. Djato. (1997). Relative Efficiency of Women as Farm Managers: Profit Function Analysis in Côte d’Ivoire. *Agricultural Economics* vol.69 (16): pp. 47-53.
- Adolwine W. M. & Dudima A. (2010). Women’s Access to Emerging Urban Land in the Sissala East District in Northern Ghana. *Journal of Science and Technology*, Vol. 30(2): pp. 94- 103.
- Agana, C. (2012). *Women’s Land Rights and Access to Credit in a Predominantly Patrilineal System of Inheritance: Case Study Of The Frafra Traditional Area, Upper East Region*. Unpublished Thesis Submitted To the Department Of Land Economy, Kwame Nkrumah University of Science and Technology In Partial Fulfillment Of The Requirements for the Degree of Master of Philosophy Faculty of Planning And Land Economy, College Of Architecture and Planning.
- Agricultural Learning and Impacts Network (ALINe) (2011). P4P and Gender : Literature Review and Fieldwork Report. Women-only focus group discussion in Kilimanjaro, Tanzania.
- Akpalu, D. A. (2013). Agriculture Extension Service Delivery in a Semi-Arid Rural Area in South Africa: The Case Study of Thorndale in the Limpopo Province. *African Journal of Food, Agriculture, Nutrition and Development*. Volume 13(4): pp. 8034–8057
- Amu, J. N. (2005). The role of women in Ghana’s economy. Retrieved on January 13, 2013 from <http://library.fes.de/pdf-files/bueros/ghana/02990.pdf>
- Aregu L., Bishop-Sambrook, V., Puskur, R & Tesema, E. (2010). Opportunities for promoting gender equality in rural Ethiopia through the commercialization of agriculture. *IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 18*. ILRI (International Livestock Research Institute), Nairobi, Kenya. pp 84.
- Asuming-Brempong, S. (2004). The Role of Agriculture in the Development Process: Recent Experiences from Ghana. Proceedings of the Inaugural Symposium, 6 to 8 December 2004.

- Bambang S. & Abubakari A. (2013). Ownership and Access to Land in Urban Mamprugu, Northern Ghana. *International Journal of Research in Social Sciences*, Vol. 2(2): pp 1 – 14.
- Banker, R. D., Datar, S. M. & Kaplan, R.S (1989). Productivity Measurement and Management Accounting. *Journal of Accounting, Auditing & Finance*, Vol 4(4): pp. 528 – 554.
- Barbier E. B. (2003). The Role of Natural Resources in Economic Development. *Australian Economic Papers*, vol, 42(2): pp. 253–272.
- Benfica R, Tschirley D, & Boughton D (2006). Interlinked Transactions in Cash Cropping Economics. Paper presented in Seminar on The Determinants of Farmer Participation and Performance in Zambezi River Valley of Mozambique at the 26th International Association of Agricultural Economists Conference in Gold Coast, Australia, August 12 to 18, 2006.
- Bhagowalia, P., Chen, S., & Shively, G., (2007). Input Choices In Agriculture : Is There A Gender Bias? *Working Paper No.07-09*, Department of Agricultural Economics, Purdue University, West Lafayette, Indiana.
- Bradshaw, S., Castellino J., & Diop B. (2013). Women's role in economic development: Overcoming the constraints. Background paper for the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. Retrieved on May 15, 2014 from <http://unsdsn.org/wp-content/uploads/2014/02/130520-Women-Economic-Development-Paper-for-HLP.pdf>
- Calderon M. M. (2003). Improved Management of Angat, Ipo, Umiray and La Mesa Watersheds in Luzon, Philippines: A contingent valuation study, university of the Philippines. Retrieved on April 20, 2013 from http://www.eepsea.org/pub/ref/11604649391model_proposal_annotated.pdf
- Chavas, J. P., Petrie, R, & Roth, M. (2005). Farm Household Production Efficiency: Evidence from The Gambia. *American Journal of Economics*, vol, 87(1): pp. 167 – 179.
- Clark, J.T. (2013). *Understanding the Gender-Based Productivity Gap in Malawi's Agricultural Sector*. An unpublished thesis submitted to the Faculty of the Graduate School of Arts and Sciences of Georgetown University in partial fulfilment of the requirements for the degree of Master of Public Policy in Public Policy. Retrieved on May 15, 2013 from https://repository.library.georgetown.edu/bitstream/handle/10822/558628/Clark_georgetown_0076M_12187.pdf?sequence=1

- Cohen, M. J. & Lemma, M. (2011). Agricultural Extension Services and Gender Equality: An Institutional Analysis of Four Districts in Ethiopia. *Discussion Paper 01094* International Food Policy Research Institute, Washington D.C.
- Dicta, O. O., Toritseju, B. & Alimeke, B. O. (2013). Gender Roles in the Productivity and Profitability of Cassava (*Manihot Esculenta*) in Ika South and Ika North East Local Government Areas of Delta State, Nigeria. *World Applied Sciences Journal*, vol, 24 (12):pp. 1610-1615.
- Duncan, B. A & Brants, C. (2004). Access To and Control over Land from a Gender Perspective: A Study Conducted in the Volta Region of Ghana. Retrieved May 15, 2013 from <http://www.fao.org/3/a-ae501e.pdf>
- Eatwell, J.M. & Newman, P. (1991). *The New Palgrave: A Dictionary of Economics*. vols. 3, 4 and 12, Macmillan, Tokyo.
- Ellis, A., Manuel, C & Blackden C. M. (2006). Gender and Economic Growth in Uganda Unleashing the Power of Women. The International Bank for Reconstruction and Development/The World Bank, Washington D.C. Retrieved on January 9, 2013 from http://siteresources.worldbank.org/INTAFRREGTOPGENDER/Resources/genderecon_growth_ug.pdf
- Fletschner, D. (2008). Women's Access to Credit: Does It Matter for Household Efficiency? *American Journal of Agricultural Economics*, Vol. 90(3): pp. 669–683.
- Flora, C. B. (2001). Access and control of resources: Lessons from the SANREM CRSP. *Agriculture and Human Values* 18: 41–48.
- Fofie, G. A., & Adu, K. O. (2013). The Impact of Rural Women's Land Rights on Food Production in the Brong-Ahafo Region of Ghana. *History Research*, Vol. 3(1): pp. 54-71.
- Gani, B. S., & Adeoti, A. I. (2011). Analysis of Market Participation and Rural Poverty among Farmers in Northern Part of Taraba State , Nigeria. *Journal of Economics*, Vol.2(1): pp. 23-36.
- Garvelink W. J. (2012). Land Tenure, Property Rights, and Rural Economic Development in Africa. Center for Strategic and International Studies. Retrieved on March 14, 2013 from <http://csis.org/publication/land-tenure-property-rights-and-rural-economic-development-africa>
- German International Cooperation^a (GIZ) (2013): Competitive African Cotton Initiative (COMPACI) Empowering Small-Scale Cotton Farmers in Sub-Saharan Africa.

- German International Cooperation^b (GIZ) (2013): Gender and Agricultural Extension. Securing Food, Harvesting the Future.
- Ghana Statistical Service (2013). Non-Monetary Poverty in Ghana. Retrieved on March 17, 2014 from [http://www.statsghana.gov.gh/docfiles/2010phc/Non-Monetary%20Poverty%20in%20Ghana%20\(24-10-13\).pdf](http://www.statsghana.gov.gh/docfiles/2010phc/Non-Monetary%20Poverty%20in%20Ghana%20(24-10-13).pdf)
- Ghana Statistical Service, (2014). 2010 Population and Housing Census. District Analytical Report, Saboba District. Retrieved on March 17, 2014 from http://www.statsghana.gov.gh/docfiles/2010_District_Report/.../SABOBA.pdf
- Gill K., Brooks, K., McDougall, J., Patel P. & Kes A (2010). Bridging the Gender Divide: How Technology Can Change Women Economically. The International Centre for Research on Women. Retrieved on May 20, 2013 from <http://www.icrw.org/files/publications/Bridging-the-Gender-Divide-How-Technology-can-Advance-Women-Economically.pdf>
- Gupta, R. & Dey, S. K. (2010). Development of a productivity measurement model for tea industry. *ARPJ Journal of Engineering and Applied Sciences* Vol. 5(12): pp. 16 – 24.
- Hill, R. V. & Vigneri, M. (2011). Mainstreaming gender sensitivity in cash crop market supply chains. *ESA Working Paper No. 11-08*. Food and Agriculture Organization, Rome. <http://www.fao.org/publications/sofa/en/>.
- Himonga, C. N. & Munachonga, M. L. (1991). Rural Women's Access to Agricultural Land in Settlement Schemes in Zambia : Law, Practice, and Socio- Economic Constraints, *Third World Legal Studies Volume 10, Article 4*.
- Horrell, S. & Krishnan, P. (2006). Poverty and Productivity in Female-Headed Households in Zimbabwe. *Journal of Development Studies*, Vol. 43(8): pp. 1351 - 1380.
- Hussein, K. (2008). Cotton in West and Central Africa : Role in the regional economy & livelihoods and potential to add value. *Proceedings of the Symposium on Natural Fibres*, pp. 25–37. International Fund For Agricultural Development, Rome.
- Ibrahim, H. I. & Ibrahim, H.Y.(2012). Access of rural women to productive resources in a rural area of northern Nigeria. *Elixir Social Science, Vol 44*, pp. 7088 - 7092.
- Jalloh, M. (2013). Natural resources endowment and economic growth: The West African Experience. *Journal of Natural Resources and Development*, Vol. 6, pp. 66-84.
- Jamison, D. & Lau, L. (1982). Farmer education and farmer efficiency. John Hopkins Press for the World Bank.

- Japan International Cooperation Agency (JICA) (1999). Country WID Profile, Ghana.
- Kabeer, N. (2012). Women's Economic Empowerment And Inclusive Growth: Labour Markets And Enterprise Development, *SIG Working Paper 2012/1 pp.1–65*.
- Kabeer, N. & Natali, L. (2013). Gender Equality and Economic Growth: Is there a Win-Win? *IDS Working Paper 417*. Institute of Development Studies.
- Kanathiah, J. (2012). Survey on cotton cropping and land preparation methods in Northern and Upper East Regions of Ghana. *GLG Consultants Working paper on field research*.
- Kaydos, W. (1991). Measuring, Managing, and Maximizing Performance. Productivity Press. Atlanta, GA.
- Keller, B. (2000). Women's Access To Land In Zambia. *International Federation of Surveyors (FIG)*. Commission 7 (Cadastre and Land Management) Task Force on Women's Access to Land, Zambia.
- Kinkingninhou-Me'dagbe' F. M., Diagne A., Simtowe F., Agboh-Noameshie A. R. & Ade'gbola P.Y.(2010). *Gender discrimination and its impact on income, productivity, and technical efficiency: evidence from Benin*. *Agric Hum Values* 27:57–69.
- Koru, B., and Holden S. (2008). "Difference in Maize Productivity between Male- and Female-Headed Households in Uganda. Retrieved on May 13, 2013 from <http://www.csae.ox.ac.uk/conferences/2011-EDiA/papers/122-Koru.pdf>
- Lilja N., Randolp T. F., & Diallo A. (1998). Estimating gender difference in agricultural productivity: biases due to omission of gender-influenced variables and endogeneity of regressors. *Selected paper submitted to the American Agricultural Economics Association Annual Meeting*. August 2 - 5, 1998.
- Malena, C. (1994). Gender issues in integrated pest management in Africa Agriculture. *NRI Socio-economic series*. National Resources institute, Chatham.
- Mauro, A. & Pallas, S.(2009). Women's Access to Land :The role of evidence-based advocacy for women ' s rights. *A note for the initiative "Land Governance in Support of the MDGs: Responding to New Challenges" organised by World Bank Washington DC*.
- Ministry Of Women And Children Affairs –MOWAC (Ghana)(2012). Rural Women and the MDGS 1 and 3: Ghana's Success And Challenges Technical Paper, Ghana's Side Event, 56th CSW, New York.

- Mohamed, K. S. & Temu, A. E. (2009). Gender Characteristics of the Determinants of Access to Formal Credit in Rural Zanzibar. *Journal of Savings and Development - No 2. pp 98 - 108*
- Moock, J.L. (Eds.), (1986). Understanding Africa's rural households and farming system. In S. Morgen (Eds.). *Gender and Anthropology. Critical Reviews for Research and Teaching*. American Anthropological Association, Washington, D.C.
- Morgan, M. (2006). Applying a Gender Lens to Katalyst Market Development Activities. *Technical Note Number 1*. Katalyst, Bangladesh.
- Nicholas, S., Crowley, E. & Komjathy, K. (1999). Women access to land. Surveyors can make a difference. *Survey Quarterly. 20: 16-19*
- Njenga, M., Karanja, N., Prain, G., Lee-Smith D & Pigeon, M. (2011) Gender mainstreaming in organisational culture and agricultural research processes. *Development in Practice, 21:3, 379-391*.
- Njuki, J.M., Kihyo, V. B. M., O'kingati, A. & Place, F. (2006). Productivity Differences between Male and Female Managed Farms in the Eastern and Central Highlands of Kenya. *Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia*. Retrieved on May 16, 2013 from <http://ageconsearch.umn.edu/bitstream/25693/1/cp060216.pdf>
- Organization for Economic Co-Operation and Development (2011). The Economic Significance of Natural Resources: Key points for reformers in Eastern Europe, Caucasus and Central Asia. Paris, France. www.oecd.org/env/eap
- Ofuoku, A. U.(2011). Gender Representation in Agricultural Extension Workforce and Its Implications for Agricultural Advisory Services. *Journal of Tropical Agricultural Research & Extension 14(2), pp 34 - 37*.
- Ogunlela, Y. I. & Mukhtar A. A. (2009). Gender Issues in Agriculture and Rural Development in Nigeria: The Role of Women. *Humanity & Social Sciences Journal 4(1): 19-30*.
- Ogunniyi, L.T., Ajao, O.A & Adeleke, O.A (2012). Gender Comparison in Production and Productivity of Cocoa Farmers in Ile Oluji Local Government Area of Ondo State, Nigeria. *Global Journal of Science Frontier Research (D) Volume XII Issue V Version I. pp. 59 - 64*.

- Okurut, N., Schoombee, A., & Van der Berg S. (2004). Credit Demand and Credit Rationing in the Informal Financial Sector in Uganda. *Paper to the DPRU/Tips /Cornell Conference on African Development and Poverty Reduction: The Macro-Micro Linkage* October. Retrieved on February 11, 2013 from [http://www.tips.org.za/files/credit_demand_and_rationing_in_Uganda_Okurut .pdf](http://www.tips.org.za/files/credit_demand_and_rationing_in_Uganda_Okurut.pdf)
- Omwoha, J. N. (2007). Gender Contribution and Constrains to Rural Agriculture and Household Food Security in Kenya: Case of Western Province. *African Association of Agricultural Economists Conference Proceedings* pp. 369- 372.
- Peterman, A., Behrman, J., & Quisumbing, A. (2010). A review of empirical evidence on gender differences in non-land agricultural inputs , technology , and services in developing countries. *ESA Working Paper No . 11-11*. International Food Policy Research Institute for Food and Agriculture Organisation.
- Peterman, A. Quisumbing, A. Behrman, J. & Nkonya E. (2011). Understanding the Complexities Surrounding Gender Differences in Agricultural Productivity in Nigeria and Uganda. *The Journal of Development Studies*, 47:10, 1482-1509.
- Quansah, E. S. T. (2012). Land Tenure System: Women's Access to Land in a Cosmopolitan Context. *Ogirisi: a new journal of African studies* vol 9 No. 8 pp.141-162.
- Quisumbing, A. R. (1994). Improving Women ' s Agricultural Productivity as Farmers and Workers. *Education and Social Policy Discussion Paper Series No. 3*. The World Bank.
- Quisumbing, A. R. (1995). Gender Differences in Agricultural Productivity: A Survey of Empirical Evidence. *Food Consumption and Nutrition Division Discussion Paper No.5*. International Food Policy Research Institute, Washington, D.C. U.S.A.
- Quisumbing, A.R. (1996) Male-Female Differences in Agricultural Productivity: Methodological Issues and Empirical Evidence. *World Development*, 24(10), pp. 1579-1595.
- Quisumbing, A. R. (2003). Household decisions, gender, and development. A synthesis of recent research. International Food Policy Research Institute, Washington, D.C. U.S.A.
- Ragasa, C., Berhane, G., Tadesse, F., & Taffesse, A. S. (2012). Gender Differences in Access to Extension Services and Agricultural Productivity. *Ethiopian Strategy Support Programme Working Paper 49*. Addis Ababa.
- Reeves, H. & Baden, S. (2000). Gender and Development: Concepts and Definitions. *BRIDGE Report No 55*. Institute of Development Studies, University of Sussex, United Kingdom. <http://www.ids.ac.uk/bridge/>

- Reisinger, H. (1997). The impact of research designs on R^2 in linear regression models :an exploratory meta-analysis. *Journal of Empirical Generalisations in Marketing Science, Volume 2: pp. 1 - 12.*
- Rogers, M. (1998). The definition and measurement of productivity. *Melbourne Institute working paper No. 9/98.* Melbourne Institute of Applied Economics and Social research, University of Melbourne.
- Sachs J. D., & Warner A. M. (1995). Natural Resource Abundance and Economic Growth. *National Bureau of Economic Research Working paper 5398.*
- Sikod, F. (2007). Gender Division of Labour and Women's Decision-Making Power in Rural Households in Cameroon. *Africa Development, Vol. XXXII, No. 3, pp. 58–71*
- Saito, K. A., & Weidemann, C. J. (1990). Agricultural Extension for Women Farmers in Africa. *Policy, Research and External Affairs Working Paper No. 398.* Population and Human Resource Department, the World Bank, Washington D. C.
- Seebens H. (2010). Intra-household bargaining, gender roles in agriculture and how to promote welfare enhancing changes. *ESA Working Paper No. 11-10*
- Suranovic S. (2010). Policy and Theory of International Trade. Flat World Knowledge Retrieved on May 15, 2013 from <http://www.amazon.com/International-Trade-Theory-Steve-Suranovic/dp/1936126443>
- Thapa, S. (2008). Gender differentials in agricultural productivity: evidence from Nepalese Household data. *Munich Personal RePEc Archive Paper No. 13722.* CIFREM, Faculty of Economics, University of Trento, Italy.
- The Montpellier Panel (2012). *Women in Agriculture: farmers, mothers, innovators and educators.* London: Agriculture for Impact.
- Thurow, R. and Kilman, S. (2010). *Enough: Why the World's Poorest Starve in an Age of Plenty.* New York: PublicAffairs. Retrieved on February 11, 2013 from www.arvindguptatoys.com/arvindgupta/enough-poverty.pdf
- Udry, C., Hoddinott, J., Alderman, H., & Haddad, L. (1995). Gender differentials in farm productivity: implications for household efficiency and agricultural policy. *Food Policy, Vol 20, No. 5, pp. 407-423.*
- United Nations Conference on Trade and Development (UNCTD)/ United Nations Development Programme (UNDP) (2008). Mainstreaming gender into trade and development strategies in Africa. *Trade negotiations and Africa series:No.4*

- United Nations Industrial Development Organization (UNIDO), International Fund for Agricultural Development (IFAD) & Food and Agriculture Organisation (FAO) (2011). Revitalizing the cotton industry. Background paper for discussion, October 2011, Ghana.
- United Nations Department of Economic and Social Affairs (UNDESA), Division for the Advancement of Women (2009). Women's Control over Economic Resources and Access to Financial Resources, including Microfinance. 2009 World Survey on the Role of Women in Development, *ESA Working Paper Number 326*. New York.
- United States Department of Agriculture (USDA) (1997). Usual Planting and Harvesting Dates for U.S. Field Crops. *National Agricultural Statistics Service Agricultural Handbook Number 628*.
- United States Department of Agriculture (2014). Retrieved on June 10, 2015 from <http://www.indexmundi.com/agriculture/?commodity=cotton>
- Uzokwe, U. N., & Ofuoku, U. A. (2005). Changes in gender division of agricultural tasks in Delta State, Nigeria and implications for agricultural extension services. *Extension Farming Systems Journal volume 2 number 1, 91–96*.
- Villabón C. C. C. (2012). *Gender Differences in Agricultural Productivity. A cross-sectional household survey data collected in 2006 in Peru*. An Unpublished Master thesis for the degree of Master of Philosophy in Environmental and Development Economics Universitetet Oslo.
- Von Braun, J., & Webb, P. J. R. (1989). The Impact of New Crop Technology on the Agricultural Division of Labor in a West African Setting. *Economic Development and Cultural Change, Vol. 37, No. 3, pp. 513–534*. The University of Chicago Press
- Wazed, M.A. & Ahmed, S. (2008). Multifactor productivity measurements model (MFPMM), as effectual performance measures in manufacturing. *Australian Journal of Basic and Applied Sciences. 2(4): 987-996*.
- Zaman, H. (1999). Assessing the Poverty and Vulnerability Impact of Micro-Credit in Bangladesh: a Case Study of BRAC. *Policy Research Dissemination Center 2145:2-7, 1-50*

APPENDICES

APPENDIX 1: QUESTIONNAIRE

DEPARTMENT OF AGRICULTURE ECONOMICS AND AGRIBUSINESS
UNIVERSITY OF GHANA, LEGON
A QUESTIONNAIRE ON THE TOPIC: GENDER AND COTTON PRODUCTIVITY
IN THE NORTHERN REGION
(M.PHIL THESIS)

1. Name
2. Age
3. Gender (1)Male[] (2)Female[]
4. Marital status (1)Married[] (2)Single[] (3)Divorced[] (4)Widowed[]
5. Are you head of the household (1)Yes [] (2)No[]
6. What is the total household size?
7. What is your level of education?
(1) None [] (2) Primary [] (3) JHS [] (4) SHS [] (5) Tertiary [] (6) Other []
8. What was your farm size?acres
9. What was your seed cotton output?Kg
10. What proportion of your seed cotton was categorized under
[1] Grade A ... Kg [2] Grade BKg [3] Grade CKg
11. Did you have ready market for your seed cotton in grade? (1)Yes [] (2)No []
12. If no, where then did you sell, them?
13. What was the price per kilogram of seed cotton of the various grades?
[1] Grade A ... GH¢ [2] Grade B ... GH¢ [3] Grade C ... GH¢
14. What kind of labour did you use on your farm?
(A) Hired Labour [] (B) Family Labour [] (C) Both

If you used both labour then answer the following questions

15. How many times did you use hired labour on your farm?
16. For how many days per session?
17. How many hired labourers did you employ per session?
18. What was the cost per hired labour per day for each session?
19. How many times did you use family labour on your farm?
20. For how many days per session?
21. When did you start land preparation?
(1) Before rains (mid April) (2) At the onset of rains(Early to Mid May)
(3) Later (After Mid May)
22. In what month was your land ploughed for you?
23. Did you do row planting in? **(1)Yes [] (2)No []**
24. How many times did you apply compound fertilizers?
(1) Once [] (2) Twice [] (3) Thrice [] (4) More []
25. What method of fertilizer application did you use?
(1) Broadcasting [] (2) Band Placement [] (3) Row Placement []
(4) Burying (5) Other []
26. How many times did you apply Sulphate fertilizers?
(1) Once [] (2) Twice [] (3) Thrice [] (4) More []
27. What method of fertilizer application did you use?
(1) Broadcasting [] (2) Band Placement [] (3) Row Placement [] (4) Burying (5) Other []
28. How many times did you spray your farm with weedicides in?
(1) Once [] (2) Twice [] (3) Thrice [] (4) More []
29. Apart from using the weedicides, did you do manual weeding in addition in?
(1)Yes [] (2) No []

30. How many times did you spray your farm with insecticides?

(1) **Once** [] (2) **Twice** [] (3) **Thrice** [] (4) **More** []

31. When did you spray your farm?

(1) **Early** [] (2) **Late** []

32. When did you do your harvesting

(1) **Early** [] (2) **Late** []

33. How long have you been into cotton production?years

34. How did you acquire your land?

(1) Inherited (2) Borrowed (3) Leased (4) Share Cropping

35. Did you have any farm apart from cotton farm? (1)**Yes** [] (2)**No** []

36. If yes, how many and what did you plant on those farms?

Number	Crop(s)

37. Did you plant any other crop apart from cotton on the same land?

(1)**Yes** [] (2) **No** []

38. If yes, what are they?

39. Are you engaged in any off-farm income activity? (1)**Yes** [] (2)**No** []

40. If yes, what is it?

41. Do you own a bicycle? (1)**Yes** [] (2)**No** []

42. Do you own a mobile phone? (1)**Yes** [] (2)**No** []

APPENDIX 2: Linear Regression Table of Factors Influencing Land Productivity

Variables	Coefficient	Standard Error	t statistics	P value
Constant	4.360503	0.7079706	6.16	0.000
<i>Socio-economic characteristics</i>				
Gender	0.3891946***	0.1374212	2.83	0.005
Farm Experience (LogExprnce)	0.0390268	0.0591564	0.66	0.510
Age of Farmer (LogAge)	0.0439693	0.1757268	0.25	0.803
<i>Farmer Attitude</i>				
Labour Used (LogLabUsed)	0.5082812***	0.1511388	3.36	0.001
Multiple crops (LogMultCrops)	0.1014015	0.1025456	0.99	0.324
Ploughing in May (MontMay)	0.3197427**	0.1252219	2.55	0.011
Ploughing in June (MontJune)	0.2641299**	0.1206692	2.19	0.030
<i>Farmer Responsibilities</i>				
Household Head (HHHead)	-0.0442985	0.0880943	-0.5	0.616
Household Size (LogHHSize)	0.148521**	0.0581065	2.56	0.011
<i>Interaction Terms</i>				
Gender*MultCrops	-0.288697**	0.1385748	-2.08	0.039
Number of observations	200			
F Statistic	5.04			
Prob > F				0.000
R-squared	21.04			