THE EFFECTS OF LAND TENURE SYSTEMS AND INVESTMENTS ON COCOA PRODUCTIVITY IN GHANA

By

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DECLARATION

I hereby declare that this submission is my own work towards my MPhil degree and that, to the best of my knowledge, it contains no material published by another person or material which has been accepted in any other University for any degree except where due acknowledgement has been made in the text.

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ABSTRACT

The overall objective of this study was to analyse the relationships between land tenure and investment as well as land tenure and cocoa productivity in the Bibiani-AnhwiasoBekwai District in Ghana. A multistage random sampling technique was used to collect data from 252 cocoa producing households. The study revealed that customary land tenure (51%), owner-operated (7%) and sharecropping (42%) are the three main land tenure systems in the district. Under the sharecropping contract, *Abunu* (96.2%) and *Abus*a (3.8%) were identified. The empirical results on investment options showed that both owner-operated and sharecropping land tenure systems had positive effect on investment in fertilizer and pesticide by the cocoa farmers. This suggests that farmers operating both owner-operated and sharecropping cocoa farms are likely to invest more into fertilizer and pesticide to increase yield. The results also revealed that both gender and age had positive effect on investment in fertilizer by cocoa farmers. Farm size exerted negative effect on investments in fertilizer but positive effect on investments in pesticide. The result further revealed that farm parcel or several farms had a positive effect on investment in fertilizer. Farm parcel or several farms recorded a negative effect with pesticide. The empirical results further indicate that both sharecropping and owneroperated tenure exert negative effects on cocoa productivity but, fertilizer and pesticide exert positive effect on cocoa productivity. The results indicate the premium cocoa farmers place on fertilizer and pesticide. Both gender and age influenced productivity negatively. Education on the other hand recorded a positive effect on productivity. One major determinant of cocoa yield, household size had a significant positive effect on productivity. It was also revealed that the effect of farm size on productivity was negative. However, credit had a negative effect on productivity indicating low or lack of credit use among the farmers interviewed. Finally, extension also took a positive sign, suggesting a high level of information dissemination on proper cocoa production technologies and management practices. The study recommends provision of cocoa fertilizer on credit under the Cocoa Hi-Tech Project and spraying of cocoa farms under the Cocoa Mass Spraying Project by the government to be revived to increase yield.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AGBL:	Ashanti Goldfields Bibiani Limited
BAB:	Bibiani-Anhwiaso-Bekwai District
CDD:	Centre for Democratic Development
CHTP:	Cocoa Hi-Tech Project
CLS:	Customary land Secretariat
CMSP:	Cocoa Mass Spraying Project
CPU:	Cocoa Production Unit
CRIG:	Cocoa Research Institute of Ghana
CSSVD:	Cocoa Swollen Shoot Virus Disease
DFID:	Department for International Development
FAO:	Food and Agricultural Organization
Gh¢:	Ghana Cedi (Currency)
GOG:	Government of Ghana
GSS:	Ghana Statistical Service
ICRAF:	International Centre for Research in Agroforestry
LAP:	Land Administration Project
MDGs:	Millennium Development Goals
MOFA:	Ministry of Food and Agriculture, Ghana
NGO:	Non- Governmental Organization
ODI:	Overseas Development Institute
OLS:	Ordinary Least Squares
UNCHS:	United Nations Centre for Human Settlements (UN-Habitat)

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DEDICATION

To Sandra Enyonam Mensah, my wife and Johannes Mawutor Alufah, my son

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The relationship between land tenure security and agricultural productivity remains a hotly debated issue all over the world. While several theoretical papers suggest that secure property rights to land such as those provided for under individualised title is likely to raise investments, improve access to credit, and induce greater effort on the part of the owners, the empirics in support of these propositions have been both scarce and less than convincing (Besley, 1995; Myra *et al*., 2007; Gavian and Ehui, 1999; Jansen and Roquas, 1998). This lack of evidential support to the hypothesised links between tenure-security and agricultural productivity could be due to several factors including the absence of such a link, the inability to measure outputs and inputs correctly, and the difficulties of trying to control for all possible factors that impinge on agricultural productivity (Chand and Yala, 2008). The motivations for deciphering the contribution of tenure forms on agricultural productivity, however, are compelling. Much of land reforms programmes within poor agrarian economies such as those in Africa and other parts of the world are premised on the assumption that improved tenure security will lead to increased agricultural productivity and thus reduce rural-poverty.

According to the United Nations Centre for Human Settlements (UNCHS, 1999), there exists close relationship between land tenure and property rights. Main justification for secure property rights to land is it providing the incentives for investment in land and sustainable development. Deininger (2003) noted that property rights affect economic growth in a number of ways. Firstly, secure property rights will increase the incentives of

households and individuals to invest, and often will provide them with better credit access, something that will not only help them make such investments, but will also provide an assurance substitute in the event of shocks. Secondly, it has long been known that in-unmechanized agriculture, the operational distribution of land affects output, implying that a highly unequal land distribution will reduce productivity. Even though the ability to make productive use of land will depend on policies in areas beyond land policy that may warrant separate attention, secure and well-defined land rights are key for household asset ownership, productive development, and factor market functioning. Land tenure and property rights affect the application of technologies for agricultural and natural resource management. Secured property rights give sufficient incentives to the farmers to increase their efficiencies in terms of productivity and ensure environmental sustainability. It is natural that without secured property rights farmers do not feel emotional attachment to the land they cultivate, do not invest in land development and will not use inputs efficiently (Tenaw *et al*., 2009).

It is on record that about 70 percent of the world's cocoa is produced by smallholder farmers in West and Central Africa. However, productivity level in the sub-region is below standard due to fragmentation of farm holdings and land tenure issues relating to tenure insecurity (FAO, 2002). Recorded productivity of Ghanaian cocoa farmers, averaging 400kg per hectare is considered among the lowest in the world. It sharply contrasts 800kg to 2,500kg per hectare farmers in South East Asia and the Caribbean have achieved. Many reasons, including insecure land tenure, have been advanced to explain this trend (Opoku *et al*., 2009). Community-based systems remain the dominant form of land tenure in Ghana. With

the economic growth surge of the past decades, the emergence of land markets and more privatised form of land holdings and other land contracts, various forms of customary tenure incite widespread land disputes and litigations. This is particularly evident in the cocoa-growing regions, characterised by agricultural commercialization and mounting pressures on land (Bruce and Knox, 1998). The Bibiani-Anhwiaso-Bekwai District is not immune to these land tenure problems as they impede agricultural development, investment and productivity, with special reference to cocoa production.

1.2 Problem Statement

Ghana's significant economic growth over the last twenty years seemed to create favourable conditions for increased agricultural productivity; however, agricultural productivity has failed to increase concordantly to reduce poverty, especially with respect to the cocoa sub-sector (Vigneri, 2008). As a result, most increases in aggregate crop production have been achieved from the expansion of cultivated land rather than increased investment in production technologies to raise crop yields per unit area of land (Vigneri, 2008).

Land tenure plays one of the vital roles in shaping farmers' land-use decisions (Adal, 2001; Adams *et al*., 1999; Belay and Manig, 2004; Deininger, 2003). Land tenure status of cocoa households in Bibiani-Anhwiaso-Bekwai District (BAB) is either tenant or non-tenant (BAB, 2005). Bibiani-Anhwiaso-Bekwai District is an area where shifting cultivation is common, where farmers (especially cocoa households) need much of investments in land development. However, their investment decisions may be affected if they are not sure how long they would be allowed to use the ownership right.

Especially the tenant cocoa households are reluctant to make investments in land management if they do not secure land tenure rights that make them vulnerable to eviction by landlords or government. It is also important to note that where property rights are absent and land tenancy is insecure, households or farmers do not care much about the land use, they however concentrate on short term profit maximizing investments at the cost of accelerating the degradation of land (Adams *et al.,* 1999; Deininger, 2003). Insecure land tenure or the lack of land ownership also restricts the cocoa households in the district access to credit that is required for improved land practices (Feder *et al*., 1988; Jemma, 2001). This lack of access to credit forces them to go for traditional land-use practices, despite their willingness to change (Migot-Adholla *et al*., 1999; Jemma, 2001).

The problem of lack of access to credit due to insecure land ownership, especially on the part of tenant cultivators is further aggravated by rural settlement nature (63 percent) of the district and high level of poverty (BAB, 2005). Insecure land tenure, lack of access to production enhancing resources, high population growth reducing access to land and other unforeseen institutional bottlenecks in the district serve as sources of lack of investment in the cocoa sub-sector, hence low productivity. However, research studies have shown that secure land tenure is an important institutional factor affecting agricultural technology utilization by smallholder farmers by providing incentives for greater investment to enhance the productivity of the land, and for that matter crop productivity (Kyomugisha, 2008).

Another challenge the district faces is leasing out of vast land by the traditional authorities for plantation agriculture (other than cocoa production) and other investment opportunities like small scale mining. The direct contribution of large-scale plantation projects

(specifically, cocoa production) to rural development is arguably in the generation of new sources of income, through participation in outgrower schemes, and plantation employment (FAO, 2008 and World Bank, 2010). This problem has

exacerbated government efforts to reduce poverty in the district, especially among the youth who would have enjoyed greater access to off-season and off-farm livelihood opportunities, such as plantation and other industrial employment. The study therefore attempts to answer the following questions;

(i) What are the types and nature of land tenure arrangements in the district?

(ii)What are the effects of land tenure systems on investments in cocoa farms in the district?

(iii) What are the effects of investments on cocoa productivity?

(iv) What are the effects of land tenure systems on cocoa productivity in the district?

1.3 Objective of the Study

The main objective is to analyse the relationship between land tenure and investment as well as the relationship between land tenure and cocoa productivity in the Bibiani-Anhwiaso-Bekwai District. The specific objectives are as follows;

(i) To examine the types and nature of land tenure arrangements in the district

(ii) To assess the effects of land tenure systems on investments in cocoa farms in the district

(iii) To examine the effects of investments on cocoa productivity

(iv) To examine the effects of land tenure systems on cocoa productivity in the

district

1.4 Justification for the Study

Land tenure, investment and productivity, particularly in Ghana are a hotly debated issue. Land is an important asset that improves the livelihoods of poorer groups in every society, the world over. Farmer livelihood decisions as regards cropping strategies and inputs are strongly influenced by land tenure arrangements (DFID, 2000). This is true as land tenure security is essential in stimulating the development of land, has the potential of credit use, enhancing collateral value of land, facilitating land transfers and lastly reducing the incidence of land disputes (Twerefou *et al*., 2011). By this, it will reduce unemployment, reduce poverty and enhance economic growth. In essence, Ghana will be on its way to achieving the Millennium Development Goals (MDGs). Thus, eradicating poverty and hunger (Goal 1), promote gender equality and empower women (Goal 3) as secure land tenure enhances socio-economic development and sustainable land use (Goal 7).

Households have a higher investment incentive if they feel that they can increase their security and will be able to reap the benefits. Results from some studies have shown that when households are secure and the tenure system is internal, investment incentives are high. Goldstein and Udry (2005) show that in Ghana, individuals who hold powerful positions in local political hierarchies have more secure tenure rights and that they invest more in their plots. Providing security of tenure is also often seen as a precondition for intensifying agricultural production and is increasingly stressed as a prerequisite for better natural resource management and sustainable development. Tenure security has a marked effect on expectations of a return on an investment of both labour and capital. This is true

in rural settings as it is in the urban sector of the economy. Farmers will be more likely to make medium- to long-term land

improvements if their tenure is secure because they will be more likely to benefit from the investment. There would be fewer disputes and they would be able to use resources that might otherwise have been used for litigation (Roth and Haase, 1998). In the presence of viable technologies, access to inputs and extension advice, and the availability of household labour and financial resources, enhanced tenure security will lead to higher investment and higher productivity.

The study also identifies Bibiani-Anhwiaso-Bekwai District (BAB) as a major contributor to cocoa production in Ghana (Vigneri, 2008). Despite the district's substantial contribution to Ghana's cocoa production over the years, it falls below (800 kg to 2,500 kg per hectare) what is achieved in South East Asia and the Caribbean (Opoku *et al*., 2009). Further to this, the district has both rural and urban settlements, the rural settlements account for 63 percent (BAB, 2005). The implication here is that the district is basically rural; therefore agriculture, specifically cocoa production with secure land tenure can be used as a development focus in order to reduce poverty in the district.

Twerefou *et al*. (2011) observed that investment in farmlands in Ghana is low and appears not to enhance tenure security. Ayalew *et al*. (2005) also argued that the perceived lack of transfer rights by farmers is the most important factor in explaining the relatively low investment in developing countries. The above studies and others (Abdulai *et al*. 2011; Tenaw *et al*. 2009; Goldstein and Udry, 2006) on land tenure, security, investment and

productivity did not focus on cocoa. Though, Quisumbing *et al*. (1999) investigated factors leading to lower cocoa yields in Western Ghana on allocated family land and rented land under share tenancy, it did not focus on investment incentives leading to lower cocoa yields in such land tenure systems. This study therefore seeks to provide empirical findings to the causal relationships between land tenure and investment as well as land tenure and productivity in the cocoa sub-sector.

1.5 Organization of the Study

The thesis is organized into five chapters. Chapter One has presented the background of the study, the research questions and the motivation of the study. Chapter Two provides literature review on land tenure and land tenure security on investment and productivity, farm size-productivity relationships, property rights, land conservation and management, land rights, gender and productivity as well as factors affecting cocoa productivity. Chapter Three discusses the research methodology adopted in the study. Chapter Four presents and discusses descriptive results and the empirical results of the study. Chapter Five provides a summary of the research findings and conclusions and policy recommendations.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents literature review of the study. It begins with the review of literature on land tenure and tenure security and their effects on investments and productivity. It continues by taking a critical look at the farm size-productivity relationship. In addition, land tenure, property rights, land conservation and management and how they affect farmers' decision making processes were also reviewed. The chapter further reviewed

literature on land rights, gender and productivity. On the issue of factors affecting investments and cocoa productivity, the literature review focused on factors such as age, education, farm size, agricultural extension services, pesticide use, credit availability, off-farm income and household labour. Finally, the chapter concludes with a review of key empirical studies and gaps identified to be addressed.

2.1 Land Tenure and Agricultural Productivity

The contribution of property right regime to agricultural productivity and thus economic growth can be placed within the broader literature on institutions and their role in development. Land tenure arrangements and their contribution to agricultural productivity picks on a strand of this much broader literature. Most of the land reforms being undertaken in several developing countries are premised on a positive and quantitatively significant causal impact of tenure security on agricultural productivity (World Bank, 2003). A number of governments in developing countries with financial and technical support from donor agencies have initiated and pursued land reforms as part of their poverty-reduction programs (Chand and Yala, 2008). As part of Ghana

Government's drive to reduce poverty and enhance equitable distribution of land, Land Administration Project (LAP) was instituted. Most of the empirical literature on land tenure arrangements and farm level productivity is based on data collected from the Asian and African continents. One set of studies, mostly drawing on the Asian experience, lends support to the proposition that tenure security raises agricultural productivity. Feder *et al*. (1988), for example, use farm-level data from rural Thailand to argue that increased tenure-security raises agricultural productivity. Feder and Nisho (1999) provided a survey of a

decade of published empirical research from developing countries, coming to the conclusion that the evidence from South East Asia and Latin American countries is one of a positive association between tenure security, access to credit, the levels of investment, and farm-level productivity. The evidence from studies on the African experience, however, is less than conclusive on the hypothesised link between tenure security and agricultural productivity. Smith (2004) notes that:

"The interaction among land tenure, fixed investments, and productivity may therefore be far from linear, and research to date leaves old questions only ambiguously answered".

According to Carter and Olinto (2003) and Schweigert, (2006) tenure security is hypothesised to impact on agricultural productivity through two distinct channels:

(i) improving access to credit and,

(ii) inducing long-term investments through reducing uncertainty with respect to the rights to the future income.

These two channels complement each other in that the first avails the credit to enable long-term investments for raising income. Cocoa is an excellent case in point given that it is a tree crop that begins to bear fruit 3-5 years after planting and continues to do so for the next 20-30 years, but with annual yields very much dependent on application of variable inputs such as fertilizer and pesticides.

2.2 Land Tenure Security and Agricultural Investments

One of the challenges that rural households may face is insecure land tenure. If the household can change tenure security (i.e., increase it), investment in security enhancement is more probable. Deininger and Jin (2006) showed that in Ethiopia, households that had just experienced land redistribution were more likely to invest in tree planting (a security enhancement measure) than terracing (productivity enhancement); however, households

that expressed an expectation of future redistribution showed lower investment. Deininger and Ali (2008) found in Uganda that a large number of tenants were willing to pay for residual property rights. Households have a higher investment incentive if they feel that they can increase their security and will be able to reap the benefits. Results from other studies (Feder *et al*., 1988; Feder and Nisho, 1999) have shown that when households are secure and the tenure system is internal, investment incentives are high. This, Goldstein and Udry (2006) showed that in Ghana, individuals who hold powerful positions in local political hierarchies have more secure tenure rights and that they invest more in their plots. Holden *et al*. (2008) show that land certification in Ethiopia stimulates tree planting. In Uganda, Deininger and Ali (2008) used overlapping land rights as an indicator of insecurity, and found that such overlapping rights reduce tenants´ incentives to invest.

Providing security of tenure is often seen as a precondition for intensifying agricultural production and is increasingly stressed as a prerequisite for better natural resource management and sustainable development (Roth and Haase, 1998). Roth and Haase (1998) further argued that tenure security has a marked effect on expectations of a return on an investment of both labour and capital. This, the authors believe is true in rural settings as it is in the urban sector of the economy. Roth and Haase (1998) added that farmers will be more likely to make medium- to long-term land improvements if their tenure is secure because they will be more likely to benefit from their investment. There would be fewer disputes and they would be able to use resources that might otherwise have been used for litigation (Roth and Haase, 1998). According to Roth and Haase (1998) assuming the existence of viable technologies, access to inputs and extension advice, and the availability

of household labour and financial resources, enhanced tenure security will lead to higher investment and higher agricultural production. Whether the frame of reference for the system of land tenure is communal or individual, there is widespread evidence that secure property rights are linked to a higher propensity to invest in tree planting, manuring, soil and water conservation and other "permanent" improvements (Maxwell and Wiebe, 1998).

Adams (2001) contributing to the debate argued that tenure security is one of the factors affecting the way households utilise assets. The author continued by stressing that if tenure is secure, the standard of living is relatively high given available household resources and an environment conducive to production. If tenure becomes insecure, however, the household becomes less productive and the standard of living declines (Adams, 2001). Adams (2001) further indicates that the main economic impact is on the resource base of the household, forcing the family to reallocate labour and income in a way that may not yield the original level of well-being. This, Adams (2001) is convinced can result in a multitude of adverse consequences such as lower nutritional status, poorer health, reduced schooling for children as incomes fall and the demand for child labour rises, as well as depletion of the productive asset base. This can affect future viability and sustainability of the household unit and can lead to food insecurity and poverty. Tenure security is basic to human rights and essential if people are to be able to manage their land resources, invest in the land and to sustain their use of it (Adams, 2001).

Literature also indicates that there is a decline in land investment as short-term use rights become more common. Therefore, it appears that the "stability" of tenure, rather than ownership, may be more important in encouraging farmers to invest in soil productivity and

adopt sustainable land-use practices. Migot-Adholla *et al.* (1991) reveal that the investment behaviour of farmers in Ghana depends on the security of land tenure. Thus farmers are considerably more likely to improve lands they own, or for which they have long-term use rights, than lands they operate under short-term use rights. In comparison to Ghanaian farmers, Migot-Adholla *et al.,* (1991) found that Kenyan farmers report higher security of land tenure and, in turn, a greater willingness to invest in their holdings. Also consistent with findings cited above from Honduras, Ghana, and Kenya, Blarel (1989) reports that Rwandan farmers were far more likely to invest in their own fields than in fields rented from others. Land tenure also plays an important role in land use patterns, which has implications for land degradation. Land-use patterns, like investments, often reflect the stability of use rights. Farmers operating under long-term use rights are more likely to plant perennial crops, produce wood, or hold the land in long fallow. Farmers sharing land or renting under short-term agreements are less likely to plant for the long term (Clay and Reardon, 1994). In this line of argument, security of tenure has again been highlighted to be very important for land investments especially for the cocoa sector to enhance productivity.

2.3 Land Tenure Security and Agricultural Productivity

There has been a considerable literature in Sub-Saharan Africa on the uncertainty as to land rights. A study in Mpigi District by Aluma *et al*. (1995) found that individual rights of sale were claimed by only 55 percent of Mailo households in Uganda. However, studies of the effect of differences in tenure systems and tenure security on agricultural investments and productivity were lacking. Place and Otsuka (2002) found that coffee planting is used by farmers in Uganda to enhance tenure security, while fallowing is practised to a greater extent by farmers on more secured holdings. This they indicated supports the notion that farmers

consider tenure implications when making investments and that different tenure system do not inhibit the promotion of tree planting investment. They concluded on the note that tenure had no impact on the productivity of crop farming. Other studies (Feder *et al*., 1988; Feder and Nisho, 1999), however, have found that tenure systems may have an impact on investment and productivity through its effects on size of holdings. Place and Hazell (1993), Carter *et al*. (1994) and Patel *et al*. (1995), found that farm size was inversely related to productivity in the low-input farming systems. Density of tree planting, for example cocoa, has also been found to be inversely related to farm size (Dewee, 1991and Place, 1995).

In contrast to the results on the tenure security/investment studies, the large majority of research examining the linkages between tenure security and efficiency find there to be little relationship. The first major study of this was Place and Hazell (1993) which found no evidence of productivity differences across different bundles of land rights in Rwanda, Ghana, and Kenya. Hunt (2003) also finds similar results for Kenya, in that the registration programme of land failed to yield significant results on productivity due to reasons such as an undeveloped credit system. Pender *et al*. (2004) similarly did not find evidence that land tenure arrangements or titling had an effect on agricultural intensification in a national level study in Uganda. In the same way, Place and Otsuka

(2002) found no impact of tenure security variables on productivity in Uganda. However, Gavian and Ehui (1999) found that total factor productivity (TFP) was similar across plots under different tenure arrangements in Ethiopia as efficiency measures and input use offset each other. Pender and Fafchamps (2006) confirmed this relationship using different econometric techniques. Deininger *et al*. (2006) found that tenure security variables did

impact on productivity in Uganda through their impact on investments in trees, but had no other direct effect. More recently, however, results from two national household studies from Uganda and Ethiopia challenge these findings. Deininger and Jin (2006) found that stronger transfer rights have a positive effect on terracing investment in Ethiopia which itself is found to have a significant impact on productivity. In another study, Deininger and Castagnini (2006) found that the presence of land conflicts had a debilitating effect on agricultural productivity across Uganda of the order of reducing it by half on disputed plots.

2.4 Farm Size-Productivity Relationship

The relationship between farm size and agricultural productivity has been inconclusive as many scholars believe so many factors come into play when comparing size of farm holdings and crop yield. Mahesh (2000) in his work in the Kerala District, India, in order to verify this relationship collected data through a sample survey in a rural locality in Kerala. A size-wise analysis of productivity indicated that it is the large farms, which have higher productivity. However, more detailed analysis using regression methods shows that no firm relationship exists between farm size and productivity. To identify the causal factors of productivity, the study further did in-depth analysis of the data. This was carried out based on the proposition that cultivators having non-farm sources of income have more access to resources for farm expenditure than cultivators whose sole source of income is cultivation and therefore unable to realise higher levels of productivity. The study did not support this proposition. Another argument is that farms employing family labour achieve productivity higher than farms employing only hired labour. In this case also, the study did not provide any conclusive evidence. On the other hand, the survey data indicated an

association between crop mix and productivity. Mahesh (2000) concluded that productivity of farms does not show any clear

relationship with farm size. It is possible that the productivity is related to a variety of factors like crop mix, input use, labour employed, and management of crop-related activities among others in addition to farm size. In the case of perennial crops (for example, cocoa, coffee, rubber and tea) once a choice is made, productivity depends only on the management of inputs; and results begin to appear after a time lag.

A study by Chattopadhyay and Sengupta (1997), using farm level disaggregated data for 1989-90 for West Bengal, India suggests that "the inverse relation between farm size and productivity becomes stronger in the agriculturally developed regions of West Bengal compared to the relatively less developed regions. This is possibly due to the effects of green revolution on smaller size farms. However, to arrive at a comprehensive view of the phenomenon more studies using disaggregated farm level data for different

States are required." The conclusions of this study have however been questioned by Dyer (1998). On a critical examination of the data and methodology, concludes that the study by Chattopadhyay and Sengupta (1997) is defective. Dyer (1998) however suggests that more disaggregated farm level data analysis needs to be carried out, especially using larger sample sizes. Dyer (1998) argued: "further, a wider range of data needs to be collected which relates centrally to peasant differentiation, technological dynamism and the development of capitalist form of agriculture."

To sum up, Dyer (1998) pointed out that the difference in the size of farms is one of the reasons for the difference in yields. This, Dyer (1998) argued that small cultivators increase cropping intensity on their farms or have multiple crops and that family labour works intensively on such farms thereby increasing output per unit of land. However, studies carried out on the relation between size of farms and productivity show contradicting results. Studies based on aggregated data showed an inverse relationship, but studies based on disaggregated data failed to confirm this. The latter indicates that the inverse relationship exists in certain types of farms, but the relation cannot be generalised. In addition, the relationship need not be there for all size groups, for all regions, and for all crops. The debate thus remains inconclusive.

Kiani (2008) also examined farm size and productivity in Pakistan using Cobb-Douglas production function. The study used variables such as total area, cultivated area irrigated, fertilizer, labour, tractor, seed cropping intensity and farm size. The major finding of this paper was that there was a negative but insignificant correlation between output per cultivated acre and farm size. The study established that small and large farm sizes have the more land productivities than middle farms. Kiani (2008) attributed the differences in productivities to the fact that productivity is high in small farms due to the intensive labour and irrigation use and middle farms used inefficient combinations of inputs while large farms used the maximum capital.

Masterson (2007) contributed to the debate in his work to assess the relationship between farm size and productivity. Both parametric and nonparametric methods were used to derive efficiency measures. The study found that smaller farms are found to have higher net farm

income per hectare, and to be more technically efficient, than larger farms. The study finally concluded that the relationship between productivity and farm size is an affirmation of the inverse relationship in the case of Paraguay. Of the three measures used (small, medium and large farms) land productivity, is significantly greater for smaller farms (especially the very smallest farms). Masterson (2007) holds the view that giving land to smaller farms will increase overall production, as well as improve the welfare of the small and landless peasantry. This study is line with

Vigneri's (2008) work on Ghana's cocoa sector boom between the years 2002-2004. Vigneri's (2008) study found that yields are higher on smaller cocoa land holdings. Vigneri (2008) suggested that the higher levels of input productivity might be due to fertilizer use (especially during the boom years) on smaller landholdings and concluded that there must be efficient allocation of resources at all levels of farms to increase cocoa productivity in Ghana. Kimhi (2003) also examines the relationship between maize productivity and plot size in Zambia using two-stage estimation, two-sided tobit, inverse relationship and recursive decision methods, however found a positive relationship between the yield of maize and plot size, indicating that economies of scale are dominant throughout the plot size distribution. The study therefore concluded that market imperfections should be targeted by any policy aimed at increasing maize productivity. In the light of above-mentioned studies, it is very clear that farm size and productivity are highly correlated but in different directions, in some negative and in some positive. Farm sizes vary from country to country and also productivity. Another important observation is that in most of the studies, Cobb Douglas production function was used for estimation.

2.5 Land Tenure, Property Rights, Land Conservation and Management

Security of tenure is widely recognised as an important prerequisite to sustainable land management (John, 2002). Vishnudas *et al*. (2005) observed that secure tenure in land will encourage people to invest in land, which leads to increased productivity, and increase in efficiency. This, Vishnudas *et al*. (2005) believe may be facilitated through negotiation of tenancy or rent contracts with emphasis on land management to provide enough long-term security to encourage soil and water conservation. Land tenure security influences farmers' decision to adopt conservation measures by influencing the length of farmers' planning horizon and sense of responsibility (Ertiro, 2006). According to Valk and Graff (1995) farmers will not be interested to invest in soil conservation measures when the land tenure is too insecure so that the benefits of soil conservation may not accrue to them. A study made in different parts of Ethiopia attributed the low level of success of natural resource conservation to land tenure insecurity (Yeraswork, 2000; Woldeamlak, 2003). Bekele (1998) using tobit model found negative association between land tenure insecurity and farmers decision to retain conservation structures on their fields. Wagayehu and Lars (2003) also predicted negative and significant association. Since stable land tenure is very important for adoption of major agricultural investments especially land improvement structures such as terrace construction (Swinton, 2000), the low level of retaining conservation structure throughout the country (Ethiopia) is attributable to land tenure insecurity (Yeraswork, 2000; Wagayehu and Lars, 2003; Bekele, 1998). Inconsistent to the above findings, Keil (2001) in his study in Zambia found no association between adopting conservation measures and land tenure security.

Blay and Damnyag (2007) working on land tenure systems and land degradation in Ghana showed that presence of tree vegetation in land use systems reduces land degradation which is manifested in reduction in the density of vegetation as well as in reduction of soil nutrients. Blay and Damnyag (2007) observed that land degradation was found to be higher in gift or share cropped lands which are continuously cropped than in lands which are periodically left fallow as either family lands or community protected lands. In relating land tenure to land degradation, Blay and Damnyag (2007) further observed that freehold lands, free lands, own land, customary hold were found not to have any significant influence on land degradation. In addition tenant farmers who have long term use rights for their farms may not degrade them, the study stressed. On the contrary, leasehold lands have significant effect on land degradation. The main implication for this study was that, as tenant farmers acquire more lands under the sharecropping (Abunu or Abusa), or cash tenancy arrangements if long term use rights of land or stability in land tenure systems is ensured, the rate of land degradation is more likely to reduce and land productivity enhanced. On the other hand, the study emphasized, if lands acquired under these arrangements are continuously cropped without accompanied investment due to insecurity in tenure arrangements, it will lead to land degradation. The study therefore proposed that efforts should be made to ensure long term land use rights or stability in land tenure systems, particularly in rural farming communities, since the core argument in the literature and in this study is that the critical issue about land degradation and land tenure nexus is not collective versus individual ownership or even ownership versus rental, but about user rights. This, Blay and Damnyag (2007) believed could be done through:

- Education of rural farming communities and traditional authorities on the benefits of long term and stable land use rights.
- Land tenure reforms should also consider how leasehold lands and share crop systems could be modified to minimize land degradation and enhance productivity.

A study by Ertiro (2006) in Ethiopia revealed that farmers who have accessed cultivation land through short-term leasing or renting have short-term planning horizon. This the study attributed to lack of stake in long-term productivity of land the farmers cultivate, they have strong preference for current income at the expense of long-term conservation investment (Ertiro, 2006) and hence they are more harmful to the land. Bible (1983) argued that separation of ownership from farm operation leads to short-term planning horizons and fewer conservation measures. In owner-operated farms, in which a farmer has a personal stake in lands' sustainability, the farmer farms harmoniously with nature and will be concerned for his neighbours and future generations (Long, 2003). Studies found tendency of operators to use more conservation practices on land they owned compared to land they rented (Atakiltie, 2003). Caswell *et al.* (2001) predicted negative association between land renting and soil conservation practices. On the contrary, Traoré *et al.* (1998) did not find a relationship between the way farmers accessed land (whether rented, leased or owned) and adopting conservation measures.

2.6 Land Rights, Gender and Agricultural Productivity

According to the office of the High Commissioner for Human Rights of the United Nations Declaration on the Right to Development in 1986:

"A rights-based approach to development is a conceptual framework for the process of human development that is normatively based on international human rights standards and operationally directed to promoting and protecting human rights."

The Commissioner went on to say that:

"Essentially, a rights-based approach integrates the norms, standards and principles of the international human rights system into plans, policies and processes of development."

The right to land in most Sub-Saharan African countries is in favour of men because of cultural norms. However, land is central to the lives of rural women where the main sources of income and livelihood are derived from land and other natural resources. According to UNECA (2003) the lack of land rights by women and girls threatens their living conditions, their economic empowerment, their physical security and, to some extent, their struggle for equity and equality within a patriarchal society. UNECA (2003) argued further that without rights to land, women's economic and physical security is compromised. Women are deprived with a reliable source of food and in addition further curtailed access to other inputs, especially credit, necessary for carrying out productive activities. It is against this backdrop that Sen (2000) argues that millions of people living in developing countries are not free, by saying:

"Even if they are not technically slaves, they are denied elementary freedoms and remain imprisoned in one way or another by economic poverty, social deprivation, political tyranny or cultural authoritarianism."

Sen (2000) suggested that governments need to contribute to development by enhancing individual freedom, which in turn is sustained by social values through institutions such as markets, political parties, legislatures, the judiciary and the media. This is because the land rights of women are crucial to their sustained livelihood, the international community, as well as their home countries, has an obligation to protect them. Walker (2002) added that

the human rights argument emphasises women's right to equality, human dignity, non-discrimination, autonomy and economic wellbeing.

Many studies have shown clearly that women's rights over land and other farm resources are inferior to those of men (Lastarria-Cornhiel, 1997; Meinzen-Dick *et al*., 1997; Place, 1995; Walker, 2002). For example, while the majority of males reported unfettered rights to give land to family members, fewer than 5 percent of women could do so across sites in Zambia, Uganda, and Burundi (Place, 1995). There are, however, a few exceptions, such as in some cocoa growing areas of Ghana where women are granted rights to land and trees through gifts (Quisumbing *et al*., 1999). LastarriaCornhiel (1997) found that women are rarely allowed to inherit land, even in matrilineal systems. As for acquiring short duration rights to land through renting or sharecropping markets, women appear to fare better (Lastarria-Cornhiel, 1997).

There have been very few studies testing the relationships between gender and efficiency. Adesina and Djato (1997) applied a profit function analysis in rice production in Cote d'Ivoire to test whether male and female farmers have different levels of efficiency. They found that average input use was similar though yields were 33 percent higher for males. However, econometric analysis found that there are no statistically significant differences in several efficiency measures. Udry *et al*. (1995) in Burkina Faso and Quisumbing *et al*. (1999) in Ghana found that productivity from plots farmed by women is lower than that of men due to non-tenure security factors such as inaccessibility to credit and inputs. Both Jackson (2003) and Walker (2002) conclude that there is very little evidence to suggest that

agricultural productivity would increase if women were granted stronger land rights, even where they provide most of the labour.

2.7 Factors Influencing Investments in Cocoa Production

Investment in inputs and soil improving technologies is an important tool in increasing agricultural production in the developing world. To increase cocoa productivity towards the more than the one tonne/hectare typically obtained in South East Asia, investments in the cocoa sub-sector must be greatly increased to achieve this target. Variables expected to influence investment in cocoa production operating inputs and soil improvement measures included age, education, farm size and agricultural extension services, and this part of the literature review addresses these factors.

2.7.1 Age

Wagayehu and Lars (2003) reported that older farmers were likely to be relatively reluctant in their decisions to take up new technologies because of their short planning horizon. However, it is also true that older farmers were likely to have more farming experience and would therefore be likely to be more receptive to new soil and water conservation technologies (Wagayehu and Lars, 2003). On the other hand, the authors believe that younger farmers would be more accommodative to new ideas and would invest in new and long term innovations. Long (2003), Lichtenberg (2001) and Wagayehu and Lars (2003) have reported negative association between investment in soil and water conservation technologies and age, as older farmers are believed to have higher personal preference

which can reduce the net present value of return from investment on long term soil conserving technologies. Consistent with the studies above, Danso-Abbeam *et al*. (2014) found negative relationship between age and investment in agrochemicals such as insecticides and fungicides in the Sefwi-Wiawso Municipality in Western Region of Ghana. Danso-Abbeam *et al*. (2014) argued that the negative relation between age and investment in agrochemicals could partially be attributed to the fact that young people are more enthusiastic in taking risk associated with innovations. In their study in Cameron, Gockowski and Ndoumbé (2004) also reported that young farmers are more likely to adopt new technologies.

2.7. 2 Education

Following Welch (1978), it is expected that better educated farmers will invest more in operating inputs as they are able to access and interpret information at a lower cost than farmers with less formal education. It has also been documented that education enhances farmer's abilities to acquire new information and respond quickly to changes in their environment, hence, educated farmers are more likely to adopt new agricultural technologies than their non-educated counterparts (Danso-Abbeam *et al*., 2014). In their study in Ghana, Danso-Abbeam *et al*. (2014) reported that education had a significant positive effect on farmer's investment in agrochemicals. Other studies such as Nkamleu and Adesina (2000) and Asfaw and Admassie (2004) also found a positive correlation between education and investment. Educated farmers tend to face lower transaction costs than non-educated farmers, and are better able to assemble and interpret technical information.

Education also promotes awareness and experiential learning. Empirical studies have shown that better educated farmers tend to allocate resources more efficiently and invest in new technology more readily than do their less educated counterparts (Bizoza, *et al*., 2007; Wynne and Lyne, 2003). Mauro (2010), in Papua New Guinea, found that education had a positive impact on investment in seasonal coffee inputs. Mauro (2010) further observed that education promotes investment in yield-increasing technologies like fertiliser and fertiliser-responsive hybrid seed, and that coffee production was not constrained by farm sizes in the study area. Dengu and Lyne (2007) report a positive correlation between education and investment in crop production amongst tenant farmers in South Africa.

2.7.3 Farm Size

A study by Bizoza *et al*. (2007) to identify factors influencing potato yields in Gikongoro province, Rwanda, found farm size to be significant and positive determinant of investment in seasonal inputs such as fertilizer and seed. In their study in Ghana, Danso-Abbeam *et al*. (2014) found that farm size is positively correlated with investment in agrochemicals. Danso-Abbeam *et al*. (2014) argued that farmers with larger farm sizes are more likely to increase their investment in agrochemicals to maintain their yield. Nkamleu *et al*. (2007) in their study in Cameron also documented positive correlation between total area cultivated and adoption of agrochemicals.

Wagayehu and Lars (2003) and Bekele (1998) reported that existence of soil conservation measures is positively related to landholding size in Ethiopia. Abdulai *et al*. (2011) report a positive correlation between investments in tree planting and mineral fertilizer application

and farm size among maize farmers in the Nkoranza District of Ghana. The study however reports a negative correlation between investment in organic manure and farm size.

2.7.4 Agricultural Extension Services

Farmers seek to reduce uncertainty about investment in new technologies through information. Farmers who know nothing about a practice cannot be expected to invest in it unless they understand its expected costs and benefits. Moreover, accurate and timely information has a positive impact on farmers' investment decisions (Traoré *et al*., 1998). Danso-Abbeam *et al*. (2014) found a positive correlation between extension service and investment in agrochemicals although not significant. Caswell *et al*. (2001) found that advice from outside sources such as extension agents and fellow farmers increased the likelihood of investment in nitrogen fertilizer application, rotating crops and using integrated pest management. Many other studies also found positive effect on the choice to practice soil conservation technologies (Keil, 2001; Baidu-Forson, 1999). A study conducted in Ethiopia indicated that if a farmer receives better information (advice) from extension agents, the farmer will be willing to construct new conservation measures and to maintain the existing ones (Wagayehu and Lars, 2003).

2.8 Factors Influencing Cocoa Productivity

Cocoa productivity in Ghana according to experts has been on the lower side. The low yield per acre or hectare had been attributed to a myriad of factors. Some of these factors being incidence of pest and diseases, low producer price, non-availability of institutional agricultural credits leading to non-adoption of recommended technologies, labour shortages, high cost of labour and other socio-economic factors which impact negatively on

Ghana cocoa farmers ability to achieve maximum yield per acre as being reported in other parts of the world. This part of the literature review addressed the following factors: pesticide use, credit availability, off-farm income and household labour.

2.8.1 Pesticide Use

Agricultural productivity in most developing countries is low due to insect pests and diseases (Adejumo, 2005; Okori *et al*., 2004). High crop yields can be achieved with sustainable agriculture if crops are protected from diseases and insects (Cook, 1986). However, most small-scale farmers in Africa do not adequately control insect pests and diseases because of the high cost of chemicals and labour (Opole *et al*., 2005). Apart from the high cost of chemicals, high applications of chemicals have side effects on the environment and on human health depending on the residue remaining in the final produce. For the purpose of this study, many diseases and insect pests affect cocoa in the field, hence affecting productivity. Predominant among them in the study area are: insect pest (capsids) and diseases like cocoa swollen shoot virus (CSSV) diseases, black pod disease (*Phytophthora pamivora* and *Phytotphthora megakarya*) causing major damage to cocoa.

Tijani (2005) working on the 'Profitability of Fungicides Use Decisions Among Cocoa Farmers in Southwestern Nigeria' using Decision Theorem Approach and Ordinary Least Square (OLS) Regression Method, observed that if profit maximization is the principal objective of an average farmer, then he/she should :

(i) not follow the recommended fungicide use rate if expected crop loss is not at least greater than 45 percent,

(ii) if it is greater than or equal to 60 percent, fungicide recommended use rate should be applied,

(iii) if less than or equal to 15 percent, 7.68kg/ha of fungicide should be applied,

(iv) if the range is 30 – 45 percent, then not more than 18.9kg/ha of fungicide should be applied per season.

The study concluded that expected crop loss should be taken into account when deciding on the amount of fungicide to apply in order to maximize farmers' income. Muthomi *et al*. (2007) assessing the 'Effect of Chemical Pesticides Spray on Insect Pests and Yield of Food Grain Legumes in Kenya' on a randomized complete block design (RCBD) in a split plot layout and replicated four times, showed that significantly higher yields were recorded on sprayed plots relative to unsprayed plots. This is an indication of the importance of agricultural investment with special reference to pesticide use leading to higher productivity in crops.

2.8.2 Credit Availability

Credit has been identified as one of major input in the development of every economy and for that matter the agricultural sector. It is necessary for capital formation, diversified agricultural production and efficiency in agricultural resource-use. This necessitated the establishment of Agricultural Development Banks (ADB), Rural and Community Banks in Ghana to meet the needs of farmers requiring agricultural credits to expand their operations. It is against this backdrop that Shephered (1979) argued that credit determines access to all resources on which farmers depend. According to Rahji (2000), credit or loanable funds is viewed as more than just another resource such as labour, land, equipment and raw

materials. Therefore, by injecting capital into agriculture, it is possible to increase the rate of agricultural development since credit has frequently been considered as one of the main factors in overcoming agricultural stagnation that helps to expand farmland size and production (Olagunju, 2000). Olagunju (2000) affirmed that credit facilities as well as the use of agricultural capital and labour resources accelerate adoption process and expand the scale of production. Olagunju (2000) further ascertained that with the introduction of credit, the farmers would be able to make possible a better combination of resources that can be employed to facilitate an increase in resource productivity. Olagunju (2007) also indicated that farmers that produced with credit use resources efficiently than those without credit. The study also found that credit users have higher use intensities for hired labour and lesser for planting materials, indicating the potency of credit in optimal reallocation of farm resources for efficient use. Olagunju (2007) concluded that the use of credit facilities would therefore translate to higher resource employment and capacity utilization, increased output and income, and reduce poverty in the rural economy, especially among farmers.

Opoku *et al.* (2009) in the study on improving productivity through group lending, an evaluation research study on the cocoa *abrabopa* initiative in Ghana, revealed that farmers who participated in the group lending programme cocoa output increased by 638.5kg relative to those farmers who had not been part of the initiative. The programme offered loans equivalent to two acres worth of inputs (fertilizer and pesticides). The credit led to increment in the application of other farm inputs. This underscores the importance of agricultural credit (in kind) in relieving farmers from diverting their resources to areas of the farming operations that the credit does not cover.

2.8.3 Off-farm Income

In this age of climate change and variability, where agricultural production is rainfed, income diversification in most agricultural household communities has become an important phenomenon to cushion farmers against any crop failure. However, does the income earned off the farm complement or compete with agricultural production activities? Experts argue that off-farm income improves household's ability to adopt technologies, enhancing investments in the farms and therefore reducing rural poverty (Haggblade, 2005). But in theory, according to Haggblade (2005) the effects of nonfarm production on agricultural production within the same households could be positive, negative, or nil, depending on a household's integration with factor or product markets. The author is of the view that in the context of market imperfections, off-farm income produces both direct and indirect impacts on agricultural production activities. One potential direct impact is a lost-labour effect, because family members' time is a critical input into off-farm income generation. If perfect labour markets exists and households can hire perfect substitutes for their labour on the farm, then crop production may not fall when more time is allocated to non-farm work (Haggblade, 2005).

Many studies have found that off-farm income tends to increase with the variability of agricultural production income (Mishra and Goodwin, 1997; Kwon *et al*., 2006), suggesting that off-farm income is a risk management tool. Other studies see income diversification as resulting from households' ability to overcome constraints on their activity choices when there are barriers to entry or to success in non-farm activities (Ellis, 1998; Barrett *et al*., 2001; Moser and Barrett, 2006). This is because access to offfarm income can loosen liquidity and/ or skill constraints that restrict households' access to more lucrative income

generating activities. López-Feldman *et al*. (2007), in their study 'Is Off-farm Income Reforming the Farm? Evidence from Mexico' employing Cobb-Douglas production function found that off-farm income had a negative effect on family labour in crop production, but a positive effect on the use of purchased inputs. However, the study found a slight efficiency gain, which they assumed to be an effect on total factor productivity. They concluded that policies that improve rural households' access to credit may, to some extent, substitute for off-farm work as a mechanism to facilitate productivity-enhancing investments on the farm. This is an indication of the role of income in the decision-making process, especially with respect to investments made by crop producing households to increase total output.

2.8.4 Household Labour

Labour is one of the major factors of production in cocoa farming. In the cocoa producing areas where the cost of labour is high, with wages well above the minimum, most households depend on family labour, including the services of children. Rural to urban migration has taken people away from cocoa producing communities leading to inadequate labour availability to meet production needs. This is one aspect underlying the use of child labour on family farms, a practice that adversely affects children's health and education. Owusu and Kwarteye (2008) found in the Western Region of Ghana that children were being used as family labour in the cocoa farms. The study found the children to be involved in various activities such as scooping, weeding, plucking of pods and pruning, gathering and heaping of pods, carting of fermented beans and carting of dry beans for sale. Dengu and Lyne (2007) also observed in the communal areas of KwaZulu-Natal Province in South Africa that there was a positive significant relationship between family labour and level of

investment in crop production. Their findings indicated that an increase in household's stock of on-farm family labour added to the level of investments in operating inputs such as fertilizer and pesticides. Table 2.1 below provides a summary of some key empirical findings and gaps identified.

Table 2. 1: Some Selected Key Empirical Studies and Gaps Identified

S/N	Author(s)/Year	Method	Summary of Findings	Gaps Identified
1	Twerefou *et al.*(2011)	Econometric Model Method	Investment in farmlands in Ghana is low and appears not to enhance tenure security and that the reverse causation of tenure security enhancing investment seems nonexistent.	The study did not focus on a specific crop and area in Ghana. It dealt mainly on tenure security, investment and the environment in general.
2	Abdulai *et al.*(2011)	Multivariate Probit Model	Land tenure differences significantly influence farmers' decisions to invest in landimproving and conservation measures.	The study focus mainly on theoretical and empirical analysis of land tenure differences and investment in land improvement measures. It was silent on the qualitative aspects of land tenure issues in Ghana.
3	Tenaw *et al*. (2009)	Qualitative Approach	Proper land ownership policy is vital in order for vast majority of population living in rural areas whose income is dependent on farming.	The study did not focus on a particular crop but discussed issues on land tenure system, land rights, agricultural productivity and the effects of climate change.
4	Quisumbing *et al*. (1999)	Econometric Model Method	Cocoa yields in Western Ghana are lower on allocated family land and rented land under share tenancy due to distorted work incentives. While men and women are equally likely to plant trees, women obtain lower yields on their cocoa plots, suggesting the presence of gender-specific constraints.	The study did not investigate investmet incentives leading to lower cocoa yields in such land tenure systems.

Source: Author, 2014

Table 2.1 Continued

S/N	Author(s)/Year	Methods	Summary of Findings	Gaps Identified
5	Goldstein and Udry (2006)	Qualitative and Profit Function Approach	Multiple and overlapping rights to land in Akwapim area of Ghana are associated with barriers to investment in land fertility.	The study was based on land rights and investment incentives without linking it to productivity of a particular crop.
6	Dormon *et al*. (2004)	Action Research Approach	Low cocoa productivity was identified as the main problem and the causes were classified into biological and socioeconomic factors. The biological factors include the incidence of pests and diseases, and epiphytes. The socioeconomic causes were indirect and include the low producer price and the lack of amenities like electricity, which leads to migration, with labour shortages and high labour costs.	The study focused only on the biological and socio-economic factors leading to low cocoa productivity in Ghana without any attention on land tenure and land right issues
7	Vigneri(2008)	Cobb-Douglas Production Function	Cocoa yields in Ghana increased 29 percent between 2002-2004 due to good weather, increased use of fertilizer, higher producer price among other factors. However, Ghana's cocoa yields remain far below the levels observed in other producing countries.	The paper did not analyse the impact of institutional factors such as land right and land tenure systems on farmers' land investment to increase cocoa productivity

Source: Author, 2014

CHAPTER THREE: METHODOLOGY OF THE STUDY

This chapter discusses the conceptual framework on the relationships between land tenure and investments, investments and productivity and land tenure and productivity. Data collection procedures included pilot survey to pre-test the research instruments, selection and training of research assistants, and types of data collected, primary and secondary data are discussed in this chapter. The chapter also describes the study area. In addition, the sampling procedure adopted for collecting data was discussed. The chapter concludes with an overview of the analytical tools employed in the study.

3.1 Conceptual Framework

Land tenure is the system of rights and institutions that govern access to and use of land (Adams, 2001). It can be further defined as the terms and conditions under which land is held, used and transacted and is one of the principal factors determining the way in which resources are managed and used and the manner in which benefits are distributed (Adams, 2001). Secure tenure is essential as it ensures a favourable climate for households or investors to generating higher levels of economic growth. Investment in this study measures both land and crop improvement practices mainly application of inputs such as fertilizer and pesticides that the cocoa producing households have undertaken to realise the final output of cocoa beans. The effects of land tenure on investments have been studied in a number of African countries. The results show that stronger land rights are often associated with an increased likelihood of making certain types of investments, for example, tree planting, fencing, and manuring (Besley, 1995;

Place and Otsuka, 2001; Gavian and Fafchamps, 1996). Deininger and Jin(2006) found that more private transfer rights have a strong positive effects on investment and terracing in countrywide sample in Ethiopia. Gavian and Fafchamps (1996) who did find that more manure was allocated to owned rather than borrowed plots in Niger.

Studies have shown that there are three main links between land rights and investment incentives (Shaban, 1987; Feder and Feeny, 1991; Besley, 1995). The first link captures the positive relation between the tenure security and investment incentives (Jacoby *et al*., 2002). The second link emphasizes the effect of the rights to collaterise land on the investment incentives (Feder and Feeny, 1991). The third provides a link between investment incentives and land transfer rights (Besley, 1995). Secure individual rights over land leads to higher levels of labour and management effort, which in turn encourages higher levels of investment to protect or enhance land fertility (Feder and Feeny, 1991). Feder *et al*. (1988) illustrate that increased tenure security is expected to enhance the productivity of farmers through the intensification effect, which reflects the effects of land tenure security on the incentives to invest, particularly in capital goods attached to land. First, if the farmer believes that he/she will be allowed to reap the long-term benefits of current investments, investment levels are likely to increase relative to a situation where there is tenure insecurity. Secondly, tenure security can increase farming productivity through an increase in allocative efficiency, which reduces the problem of lack of credit faced by farmers with tenure insecurity. Thirdly, with limited access to credit, farmers allocate inputs under quantitative constraints. With secure tenure as collateral, these constraints are eliminated and farmers can borrow freely to increase their application of inputs to profit-maximizing

levels. Several studies, for example (Bruce, 1988) have also questioned the direction of causality between tenure security and investment, arguing that tenure security may not cause investment to increase but rather investment may stimulate tenure security. A study by the World Bank (MigotAdholla *et al*., 1994) on Ghana concluded that tenure security has a clearly positive impact on investment in the Anloga area but a less noticeable impact in Wassa and no influence in Ejura.

Productivity in this study measures yield of bags of cocoa beans produced per acre by cocoa producing households for the 2012/2013 cocoa season or year. In contrast to the results on the land tenure and investment studies, the large majority of research examining the linkages between land tenure and efficiency find there to be little relationship. The first major study of this was Place and Hazell (1993) which found no evidence of productivity difference across different bundles of land rights in Rwanda, Ghana, and Kenya. However, Gavian and Ehui (1999) found that total factor productivity was similar across plots under different tenure arrangements in Ethiopia as efficiency measures and input use offset each other. Deininger *et al*. (2006) also found that tenure security variables did impact on productivity in Uganda through their impact on investments in trees, but had no other direct effect. Deininger and Jin (2006) found that stronger transfer rights have a positive effect on terracing investment in Ethiopia which itself is found to have a significant impact on productivity. Place (2009) reports that the relationships between land tenure, investment and productivity is such that, whenever there is increased tenure security, there is increased investments in land. This, Place (2009) believes brings about increased purchase of inputs leading to increased

productivity.

3.2 Empirical Models

The causal relationship between land tenure and investment follows closely the approach adopted by Brasselle *et al*. (2002) with some modifications. The modification primarily centres on the measurement of land tenure. In this study, land tenure was measured as a binary variable indicating; 1 if the cocoa farm is owner-operated system (OWNER), or under customary land tenure system (CUSTOM), or under sharecropping contract (SHARE), and 0 otherwise. Unlike the study by Brasselle *et al*. (2002) where land right was measured as continuous variable. The effects of the land tenure systems on investments are specified as:

$$\text{□} = \text{†} + \text{□} + \text{□}' + \mu(1)$$

where; □ denotes the investment options in cocoa production in the district, including investments in fertilizer and pesticide respectively.

□ denotes a vector of land tenure types (OWNER, CUSTOM AND SHARE)

□′ denotes the individual household characteristics such as gender, age, years of formal schooling, household size, membership of farmer-based organization, off-farm income of household head, as well as farm characteristics such as farm size, farm parcels, farming experience, farm labour, distance of farm from home, access to credit and access to extension services.

The relationship between land tenure systems and investment options and cocoa productivity is represented by:

$$\text{□} = \text{ℎ} + \text{T}\text{ð} + \hat{\text{O}}\text{ℯ} + \text{□}\text{ð}' + \text{ℊ} \quad (2)$$

where;

□ is yield of cocoa measured as output per acre ð is land

tenure types (OWNER, CUSTOM and SHARE) ℯis the

investment options (FERT and PEST)

ð' is a vector of exogenous variables including household and farm characteristics ℎ denotes the constant term T, $\hat{\text{O}}$ðð□ are vector of coefficients of the investment options, land tenure systems, and individual and household characteristics respectively ε is error term

3.3 Estimation Procedure

In this study, there is a possibility of land tenure being influenced by investment, resulting in endogeneity bias; therefore, there is the need to test for endogeneity bias. To do this, the study followed the Two-Stage Conditional Maximum Likelihood (2SCML) procedure, which has formally been developed by Rivers and Voung (1989) and used by Besley (1995), Brasselle *et al*. (2002) and Abdulai *et al*. (2011). The study applied the bivariate probit regression to estimate Equation (1) to find the effect of investment on land tenure systems. However, the study first estimated Equation (1) using Linear Probability Model (LPM) for owner-operated tenure (OWNER) where the residual,

RESOWNER was generated and for sharecropping contract (SHARE), the residual generated was RESSHARE. This is the first-stage regression of OWNER and SHARE as presented in Appendices A1 and A2 respectively. The study then uses the generated

residuals as explanatory variables in the second-stage investment equation, as in Equation (3).

ɹ= † + ∑ ○○ + ○ ′ + ○○+ μ , ○= 1, 2, 3 (3)

where; ɹ is investment options fertilizer and pesticide

○is land tenure types (owner-operated, customary land and sharecropping contract)

○ is coefficient of residuals

○ represents the residuals (RESOWNER and RESSHARE)

The procedure establishes whether there is endogeneity bias between land tenure and investment. Using the test of significance of m, the coefficient of e, if m does not significantly differ from zero, then there is no endogeneity bias as asserted by Brasselle *et al*. (2002).

The study now turns attention to the estimation of the productivity equation that is Equation (2). Here, because of the potential endogeneity of fertilizer and pesticide variables, they were first estimated by Linear Probability Model using the investment equation (Equation 1), to predict residuals from first-stage regressions (Appendices A3 and A4). The residuals predicted were RESFERT for fertilizer and RESPEST for pesticide, then using the predicted values or residuals in the productivity equation,

Equation (2). This transforms equation (2) to

○ = ʉ + ∑ T○ + ∑ ○ɹ̂+ □○′+ ○○○ + ȡ, ○= 1, 2, 3 (4)

where;

ိis coefficient of residuals ်ာ represents the

residuals (RESFERT and RESPEST)

The potential endogeneity of fertilizer and pesticide variables, could be due to the fact that in some cases, cocoa beans or cocoa farm itself can be used to secure investment inputs such as fertilizer and pesticide from cocoa purchasing clerks. The description of all variables (both dependent and explanatory) in the estimation procedure is as indicted in Table 3.1.

Table 3. 1: Description of variables

Variable	Definition of variables
Dependent variables	
YIELD	Total output of cocoa per acre for the year 2012/2013
FERT	1 if cocoa farmer applies fertilizer, 0 otherwise
PEST	1 if cocoa farmer applies pesticide, 0 otherwise
Explanatory variables	
Tenure variables	
OWNER	1 if cocoa farm is under owner-operated system
CUSTOM	1 if cocoa farm is under customary land tenure system
SHARE	1 if cocoa farm is under sharecropping contract
Household characteristics	
GEND	Gender, 1 if farmer is a male, 0 otherwise
AGE	Age of cocoa farmer (in years)
EDUC	Years of formal education of cocoa farmer
HSIZ	Household size of farmer
MORG	1 if farmer is a member of a farmer-based group, 0 otherwise
OFMT	1 if farmer engages in off-farm activity, 0 otherwise
Farm characteristics	
FSIZ	Farm size (in acres)
FPAR	Number of cocoa farm parcels owned by farmer or several plots or farms
EXPR	Farming experience (in years)
FLAR	Number of farm labour
FDIS	Farm distance from homestead (in km)
CRDT	1 if farmer accessed credit, 0 otherwise
EXTN	1 if farmer received extension services, 0 otherwise

Source: Author (2014)

3.4 Hypotheses of the Study

The following hypotheses were tested;

(i) Owner-operated tenure exerts positive effect on investments in fertilizer and pesticide.

(ii) Sharecropping and customary land tenure systems exert negative effects on investments in fertilizer and pesticide.

(iii) Owner-operated tenure exerts a positive effect on cocoa productivity.

(iv) Sharecropping and customary land tenure systems exert negative effects on cocoa productivity.

(v) Investments in fertilizer and pesticide exert positive effects on cocoa productivity.

3.5 Data Collection

A pilot survey was conducted in the district in November and December, 2013, one month to the actual field data collection. It was carried out to pre-test the research instrument (Appendix A5) and work out modalities for the identification of all stakeholders, especially those in cocoa production and extension officers. The pilot survey also facilitated the identification of research assistants for the main study and to familiarise with the environment of the study area. After the pilot survey, various items in the research instrument that were inconsistent and redundant were removed and a final version of the research instrument prepared.

Two research assistants were selected from the study area based on their ability to speak English and Twi languages fluently. This was a prerequisite as the respondents can express themselves in these languages very well. The research assistants were given one day training on how best to translate the questionnaire from the English language to Twi with assistance from an extension officer. The training also involved the relevance of each

question in the questionnaire as far as the research is concerned, how best to introduce the topic to the respondents and its importance for the district, research ethics among others. The training was concluded with demonstration of how to administer the questionnaire in the field in the presence of the research assistants. Thereafter, the research assistants were asked to administer some of the questionnaires with supervision by the researcher and extension officer.

Primary data for the study was collected using a structured questionnaire (Appendix A5) for heads of household cocoa farmers and key informant interview guides for both experts and cocoa farmers who are well informed about land tenure, investment in cocoa and its production in the district. A total of 252 cocoa producing households were randomly selected in the district for questionnaire responses. Additional information on land tenure and investment in the cocoa sub-sector was collected from representatives of stakeholder institutions (for instance, Ministry of Food and Agriculture and CommunityBased Organizations) in the district using the survey instrument. To complement the information gathered using the questionnaire, randomly selected key informants who are mainly traditional and opinion leaders in the communities were interviewed using the key informant interview guide. This gave the researcher an opportunity to have an insight into the problem of land tenure, investment and its effect on cocoa productivity in the district.

Secondary data was collected from both published and unpublished materials on the study area, land tenure, investment and productivity in the cocoa sub-sector in general. Specific sources consulted for secondary data included journals, reports, magazines, books, theses, encyclopaedia, internet and other records or sources of relevance to the study. Information

from public, private and international organization's resource centres and libraries were given special attention during the literature review as this leads to realistic interpretation of results by triangulation.

3.6 The Study Area

3.6.1 Location, Size and Population

The study was conducted in the Bibiani-Anhwiaso-Bikwai District located in the Northeastern part of the Western Region. It is one of the thirteen administrative districts in the

Western Region of Ghana. Geographically, the district is located between latitude 6° N, 3° N and longitude 2° W, 3° W (Figure 3.1). It is bounded on the North by the Atwima Mponua District in the Ashanti Region, South by the Wassa Amenfi in the Western Region, West by the Sefwi Wiawso District in the Western Region and East by the Denkyira North and Amansie East in the in the Central Region and Ashanti Region respectively. It covers an area of 873 km^2 representing 8.6 percent of the total land area of the region. Bibiani, the district capital is 88 km from Kumasi in the Ashanti Region and 356 km from the regional capital, Sekondi (BAB, 2005). Total population is estimated to be about 123,727 with 48.8 percent male and 51.2 percent female (GSS,

2012).

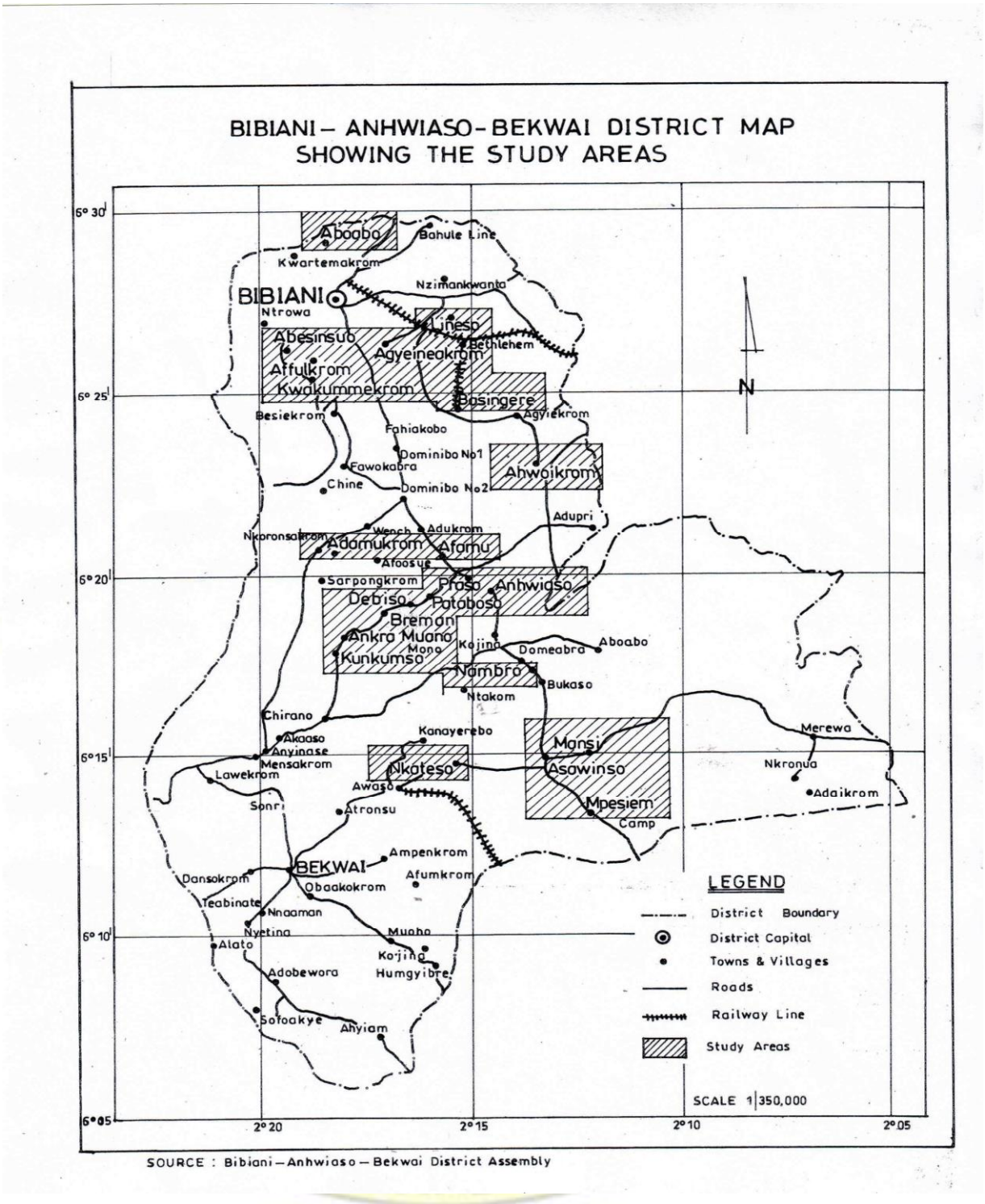

Figure 3. 1: Map of Bibiani-Anhwiaso-Bekwai District

Source: Physical Planning Department, Bibiani-Anhwiaso-Bekwai District Assembly

3.6.2 Climate and Agro-Ecological Zones

The district is located in the equatorial climate with the annual rainfall average between 1200mm and 1500mm.The pattern is bimodal, falling between March-August and September-October and the peak periods are June and October. The dry season is noticeable between November-January (BAB, 2005). The average temperature throughout the year is about 26°C. There is a high relative humidity averaging between

75 percent in the afternoon and 95 percent in the night and early morning (BAB, 2005). The implication here is that the climate of the area is suitable and can facilitate the growing of most traditional and non- traditional crops for exports. Some of the traditional crops are cassava, yam and plantain. The non-traditional crops also include pineapple and cashew. The district falls within the Equatorial Rain Forest Zone. The natural vegetation is moist-deciduous forest, with the Celtie-Triplochiton Association dominating. In this area the tree species, examples Odum, Mahogany and Sapele form the basis of the flourishing Ghana Timber Industry. Hence, the district is a suitable location for the establishment of timber firms.

3.6.3 Soils, Vegetation and Land Use

The major soils in the district are forest oxysols and forest ochrosols. The oxysols soils are rich in mineral deposits making mining the most important and lucrative economic activity in the district. The most noted minerals are gold and bauxite. The companies dealing in mining include; Ashanti Goldfields Bibiani Limited (AGBL) at Bibiani;

Chirano Goldfield Limited at Chirano and Ghana Bauxite Company Limited at Awaso.

The geology of the district is dominated by the Precambrian Metamorphic rocks of the Birrimian and Tarkwain formation (BAB, 2005). The rich forest ochrosols and forest oxysols soils are conducive for the cultivation of both food and industrial crops. These soils give rise to land use systems as natural forest, cocoa, coffee, oil palm, citrus fruits, and food crop cultivation like maize, rice, cassava, cocoyam and vegetables. The vegetation (moist-deciduous forest) is influenced by climate, soil conditions and human activities.

3.6.4 Socio-economic Activities

The agricultural sector is the most important sector employing more than half of the district's labour force. Specifically, the agriculture sector alone employs about 61 percent of the labour force with 34 percent female participation (BAB, 2005; GSS, 2012). Although the district has both rural and urban settlements, the rural settlements accounts for 63 percent. The implication here is that the district is basically rural; therefore agriculture can be used as a development focus in order to reduce poverty in the district. Other livelihood options include mining, saw milling, artisan works and petty trading. Most households are involved in more than one of these activities at the same time in an effort to diversify sources of income.

3.7 Sampling Procedure

The study used a multistage random sampling procedure for selecting cocoa household heads in the district, proposed by Sarantakos (1997), and Mugenda and Mugenda, (1999) and applied by Amos (2007) and Owusu and Kwarteye, (2008). However, the

Western Region was purposively selected because of its economic importance as one of leading producer of cocoa in Ghana. For the 2005/2006 cocoa season, about 50 percent of the volume of cocoa produced in Ghana was from the Western Region, and out of this, Bibian-Anhwiaso-Bekwai District contributed substantially to this amount (Vigneri, 2008). To ensure sufficient representation of cocoa producing households, the district was further divided into three main zones (Northern, Middle and Southern) for questionnaire administration. In all, a total of 252 cocoa producing households were sampled from the district with 53 households for the northern zone, 102 households for the middle zone and 97 households for the southern zone. Figure 3.1 and Table 3.2 show the zones and communities sampled for the study and percentage contribution of each zone to the sample.

Table 3. 2: Sample communities and households for the study

Zone	Community	Number of Household	Zone Total	Percentage Contribution of Zone (%)
Northern	Aboabo	1		
	Lineso	7		
	Basingere	1		
	Affulkrom	18		
	Agyeikrom	2		
	Kwaku Mmekrom	19		
	Abesinsuo	5	53	21.03
Middle	Ahwoikrom	1		
	Adamukrom	2		
	Afanu	35		
	Debiso	12		
	Anhwiaso	3		
	Breman	15		
	Nambro	1		
	Kunkumso	5		
	Ankra Muano	6		
	Tanoso/Praso	10		
	Pataboso	12	102	40.48
Southern	Nkateso	2		
	Mansi	56		
	Asanwinso 'A'	32		
	Mpesiem	7	97	38.49
Total		252	252	100

Source: Field Survey (2014)

3.8 Data Analysis

In this study, both descriptive and empirical analyses were used to achieve the set objectives. Descriptive analysis such as pie chart, frequencies, percentages, cross tabulations, means, standard deviations were first used to describe the data. The descriptive analysis is important as it is used to summarize the data collected to reveal emerging trends and logic. The descriptive centred on the three main land tenure systems the results identified, thus owner operated, customary land and sharecropping tenure systems. The descriptive analysis also focused on the relationship between land tenure and personal and household characteristics (gender, ethnicity, age and education) and that of farm characteristics (mainly, farm size, experience in farming, distance of farm from home and farm parcel). The mean productivity for the three main land tenure systems was determined and the level of application of the fertilizer and pesticide in the district was also determined using frequencies and percentages.

The study applied the bivariate probit regression to estimate the investment equation to find the effect of land tenure systems on investment. However, the study first estimated the investment equation using tenure as the dependent variable using Linear Probability Model (LPM) for owner-operated tenure and sharecropping contract. In each of the estimations, the residuals were predicted. The predicted values were then put into the bivariate probit regression model. The dependent variables of the model were fertilizer and pesticide. Among the variables that were investigated empirically included owneroperated, sharecropping, gender, age, education, farm size, farm parcel and credit. Finally to achieve the objective of examining the relationship between productivity, land tenure and

investment, two first-stage regression models were estimated for fertilizer and pesticide because of potential endogeneity of these two variables. The predicted residuals were then used in the second-stage productivity regression model. Some of the variables analysed in the empirical model were owner-operated, sharecropping,

fertilizer, pesticide, gender, age, extension, among others.

CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter is made up of two main sections. The first section gives a general description of the field data and the land tenure systems. The descriptive analysis includes discussion on the three main land tenure systems, cocoa producing household characteristics (gender, ethnicity, age and education) and land tenure, and that of farm characteristics (mainly, farm size, experience in farming, distance of farm from home and farm parcel) and land tenure in the study area. With respect to empirical analysis, factors influencing land tenure and investments as well as land tenure and cocoa productivity in the study area are discussed.

4.1 Descriptive Results

This section gives the general description of the field data collected. Descriptive analysis such as pie chart, frequencies, percentages, cross tabulations, means, standard deviations were first used to describe the data. The descriptive centred on the three main land tenure types the results identified, thus owner operated, customary land and sharecropping arrangement. The descriptive analysis also focused on the relationship between land tenure and personal and household characteristics (gender, ethnicity, age and education) and that of farm characteristics (mainly, farm size, experience in farming, distance of farm from home and farm parcel). The mean productivity for the three main land tenure types was

determined and the level of application of the fertilizer and pesticide in the district was also determined using frequencies and percentages.

4.1.1 Results of Land Tenure Systems in the District

Three main land tenure arrangements were identified in the study area covered (Figure 4.1). These are owner-operated (purchased) (7%), customary land tenure (51%) and sharecropping (42%). Under the owner-operated system, the landholder has full property rights over the land or farm being cultivated. According to Abdulai *et al*. (2011) farmers operating on these owner-operated lands have transfer rights'; including rights to sell the parcels, although in some cases family approval has to be acquired before the land can be sold. Customary land is a piece of land which is communally owned and has it highest (allodial/paramount) interest traceable to a stool, skin, clan or family, the occupant/head of which holds such lands in stool or skin or members of that particular family (CDD, 2002). Hence under the customary land tenure, land is inalienable and the living must use the land so that the interests of the future unborn generations are not jeopardized.

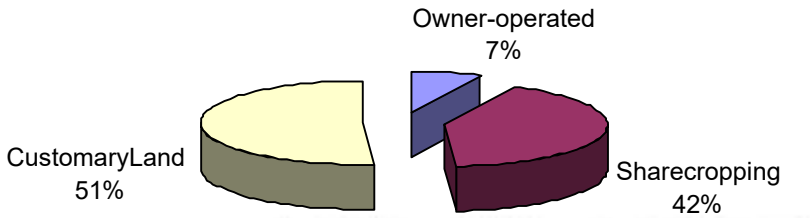

Figure 4. 1: Types of land tenure systems

Source: Field Survey (2014)

In the light of this, each member of the community has a right to occupy and use part of the land for his/her livelihood and no individual could alienate these rights to another. In addition, the land is commonly owned and there are no defined boundaries for the exclusive use of members of the community (Mends, 2006). This has created community and family land boundary demarcation problems generating disputes between concerned parties in the study area. Under a sharecropping contract, an arrangement is made between the landlord and the operator or tenant, such that part of the output is given to the landlord as compensation for using the land (Abdulai *et al*., 2011). Two forms exist in the study area. *Abunu* (96.2%) is where tenants are

responsible for all the tasks (clearing land, establishing cocoa farms, weeding, spraying and harvesting) and in return receive a half share of the cocoa harvest. And *Abusa* (3.8%), where tenants manage already established cocoa farms and in return get onethird and the landowner takes two-third.

4.1.2 Personal and Household Characteristics and Tenure

The characteristics considered under this section include gender, ethnicity, age and educational as indicated in Table 4.1, majority of the males (72.1%) have their cocoa farms on customary lands. This could be due to the fact that farming as an activity is a male dominated enterprise because of its strenuous nature, while the females are involved in petty trading. More importantly, women are rarely allowed to inherit land in

Ghana, even in matrilineal systems in the study area. This confirms Lastarria-Cornhiel (1997) study on land rights and gender. However, a few exceptions do exist, such as in some cocoa growing areas of Ghana where women are granted rights to land and trees through gifts under the customary tenure system (Quisumbing *et al*., 1999).

Table 4. 1: Gender and ethnicity with tenure types

	Customary land		Owner-operated		Sharecropping	
Gender	Frequency	Percent	Frequency	Percent	Frequency	Percent
Female	36	27.9	11	61.1	25	23.8
Male	93	72.1	7	38.9	80	76.2
Total	**129**	**100**	**18**	**100**	**105**	**100**
Ethnicity						
Akan	125	96.9	16	88.9	98	93.3
Ewe	0	0.0	2	11.1	0	0
Northerner	4	3.1	0	0.0	7	6.7
Total	**129**	**100**	**18**	**100**	**105**	**100**

Source: Field Survey (2014)

The owner-operated system saw a high percentage of females (61.1%). The reason could be due to fact that since they are not allowed to inherit land under the customary system, the females mobilise resources to own a plot under the owner-operated system.

However, it was not surprising that a higher number of males (76.2%) were involved in sharecropping arrangement as most men in the district are into cocoa farming. As indicated in Table 4.1, most of the Akans (96.9%) operate under the customary land tenure system as the district is an Akan dominated area and they are the custodians of the land. Under the owner-operated system and sharecropping arrangement, the Akans dominated. The few migrants such as Ewes and Northerners, especially, Northerners (6.7%) came out slightly under the sharecropping contract.

Table 4. 2: Distribution of age and education with tenure types

	Customary land		Owner-operated		Sharecropping	
Age (years)	Frequency	Percent	Frequency	Percent	Frequency	Percent
18-25	6	4.7	0	0.0	3	2.9
26-35	15	11.6	1	5.6	22	21.0
36-45	34	26.4	2	11.1	50	47.6
46-55	42	32.6	5	27.8	23	21.9
56-65	25	19.4	8	44.4	6	5.7
65+	7	5.4	2	11.1	1	1.0
Total	**129**	**100**	**18**	**100**	**105**	**100**
Education						
None	33	25.6	3	16.7	21	20.0
Primary six	33	25.6	4	22.2	26	24.8
Junior high	21	16.3	2	11.1	30	28.6
Middle school	25	19.4	3	16.7	10	9.5
Senior high	15	11.6	3	16.7	14	13.3
College/polytechnic	2	1.6	3	16.7	4	3.8
Total	**129**	**100**	**18**	**100**	**105**	**100**

Source: Field Survey (2014)

As indicated in Table 4.2, it is clear that older people operate under the customary land tenure system in the district as age brackets 36-45, 46-55 and 56-65 recorded 26.4%, 32.6% and 19.4% respectively. This is the working age group and the age group where most of them, especially the men inherit the cocoa farms from their parents. Under the owner-operated system the age brackets 36-45, 46-55 and 56-65 recorded 11.1%, 27.8% and 44.4% respectively. From Table 4.2, it came out clearly that more than half (51.2%) of the

respondents practising customary land tenure had no formal education or primary six. With respect to owner-operated and sharecropping tenure arrangements, the trend has been almost the same. As the level of education of the respondent increases, the number of respondents engaged in the tenure arrangement reduces. The explanation to this trend could be that highly educated people do not normally engage in farming activities or leave their farms under the care of tenant farmers.

4.1.3 Farm Characteristics and Tenure Types

The farm characteristics considered are farm size, experience in cocoa farming, distance of farm from home, number of farm parcels and yield or productivity for 2012/2013 cocoa season, as indicated in Tables 4.3, 4.4, 4.5 and 4.6. As indicated in Table 4.3, 41.1% of farmers practising customary land tenure operate on 0.5-5 acres of cocoa farm and 39.5% work on 6-10 acres. It is clear from Table 4.3 that farmers operating under the customary system work on smaller acres of cocoa farms. This could be due to fragmentation of farmlands with the increase in population the area is experiencing. With the owner-operated tenure, the results revealed that farmers under this system are operating on relatively bigger cocoa farms with the minimum falling within 6-10 acres and the maximum within 26-30 acres.

Table 4. 3: Distribution of farm size with tenure types

	Customary land		Owner-operated		Sharecropping	
Farm size (acres)	Frequency	Percent	Frequency	Percent	Frequency	Percent
0.5-5	53	41.1	0	0.0	54	51.4
6-10	51	39.5	7	38.9	35	33.3

11-15	16	12.4	3	16.7	12	11.4
16-20	6	4.7	3	16.7	3	2.9
21-25	1	0.8	4	22.2	1	1.0
26-30	1	0.8	1	5.6	0	0.0
30+	1	0.8	0	0.0	0	0.0
Total	**129**	**100**	**18**	**100**	**105**	**100**

Source: Field Survey (2014)

It is surprising to note that most of the farmers operating under the sharecropping arrangement work on relatively smaller farms within 0.5 -20 acres with more than half (51.4%) of their farms size within 0.5-5 acres. The reason could be that entrusting a big acreage of cocoa farm to a tenant farmer could create managerial problems.

Table 4. 4: Experience in farming and distance of farm from home with tenure types

	Customary land		Owner-operated		Sharecropping	
Experience (years)	Frequency	Percent	Frequency	Percent	Frequency	Percent
1-10	24	18.6	2	11.1	26	24.8
11-20	53	41.1	7	38.9	47	44.8
21-30	31	24.0	5	27.8	25	23.8
31-30	16	12.4	3	16.7	7	6.7
41-50	3	2.3	1	5.6	0	0.0
50+	2	1.6	0	0.0	0	0.0
Total	**129**	**100**	**18**	**100**	**105**	**100**
Distance (km)						
1-5	114	88.4	12	66.7	92	87.6
6-10	13	10.1	4	22.2	13	12.4
11-15	0	0.0	1	5.6	0	0.0
26-30	1	0.8	0	0.0	0	0.0
30+	1	0.8	1	5.6	0	0.0
Total	**129**	**100**	**18**	**100**	**105**	**100**

Source: Field Survey (2014)

From Table 4.4, experience in cocoa farming for 11-20 years has been the highest for all the three land tenure systems identified in the field. The results revealed that customary land had 41.1%, owner-operated recording 38.9% and sharecropping contract having 44.8%. The results further revealed that a higher percentage of farmers operating under the various

tenure systems had their farms within 1-5 kilometres from their homes. As indicated in the Table 4.4, customary land had 88.4%, owner-operated recorded 66.7% and sharecropping having 87.6%.

Table 4. 5: Distribution of farm parcel with tenure types

	Customary land		Owner-operated		Sharecropping	
Farm parcel	Frequency	Percent	Frequency	Percent	Frequency	Percent
1-2	78	60.5	2	11.1	71	67.6
3-4	43	33.3	12	66.7	31	29.5
5-6	4	3.1	3	16.7	2	1.9
7-8	3	2.3	0	0.0	0	0.0
9-10	0	0.0	1	5.6	0	0.0
10+	1	0.8	0	0.0	1	1.0
Total	**129**	**100**	**18**	**100**	**105**	**100**

Source: Field Survey (2014)

From Table 4.5, a higher percentage of cocoa farmers own a number of farm parcels under all the three land tenure systems. The results indicate that most of the farm parcels fall within 1-2, 3-4 and 5-6 categories. This high number of parcels could be due to high population leading to fragmentation of land, giving rise to small land holdings by families. More importantly, fragmentation of cocoa farms leading to more farm parcels is as a result of inheritance of cocoa farms under the customary or family land tenure system. This is in line with a study in Western Ghana by Quisumbing *et al*. (1999), that inherited and temporarily allocated family lands, which are characterized by weak land rights, are being transferred to wives and children as inter-vivos gifts.

Table 4. 6: Distribution of cocoa productivity

Land Tenure Type	**Mean**	**Standard Deviation**

Customary Land	2.90	1.25
Owner-Operated	2.52	1.24
Sharecropping	2.36	1.37

Source: Author's Calculation from Field Survey (2014)

However, when the mean productivity of each of the land tenure types were compared, it came out clearly that irrespective of the boundary demarcation and disputes problems that emanate from customary land tenure system, it recorded the highest mean productivity of 2.90 as shown in Table 4.6. Meaning, one acre of cocoa farm produces 2.90 bags of cocoa beans (1 bag = 64kg). This could be due to higher percentage (51%) of farmers practising this type of land tenure in the district.

4.1.4 Investments in Cocoa Production

The results of investments that affect cocoa yield are as presented in Table 4.7. The results indicate that more than half of the respondents applied fertilizer in their cocoa farm for 2012/2013 cocoa season with 39.7% not applying fertilizer at all.

Table 4. 7: Distribution of investments in cocoa production

Investment	Category	Frequency	Percent
Fertilizer	Yes	152	60.3
	No	100	39.7
Pesticide	Yes	219	86.9
	No	33	13.1

Source: Field Survey (2014)

The result further revealed that as high as 86.9% of the respondents had applied pesticide, mostly fungicide to control the black pod disease on their cocoa farm. It is not surprising that pesticide application had that huge patronage as the district is earmarked for the control of black pod disease and almost all the farmers benefit from the government's cocoa mass spraying project every year.

4.2 Empirical Results

This section of the analysis provides the empirical findings of the study and is divided into three main parts. First, the mean and standard deviation for all the econometric variables were calculated and discussed. Second, two regression models were estimated to assess the relationship between land tenure and other variables on investment options (fertilizer and pesticide) and the results discussed. Finally, a regression model was estimated to assess the effects of land tenure, investments and other determinants on cocoa productivity in the district.

The descriptive statistics of the variables used in the regression model are provided in Table 4.8. One of the key determinants of cocoa production, yield or productivity recorded a mean value of 2.65. Meaning, one acre of cocoa farm produces 2.65 bags (1 bag = 64kg). The mean value for the two main investments (fertilizer and pesticide) considered in the study was calculated. Fertilizer (preferably special cocoa fertilizer 'Asaase Wura') recorded mean value of 0.60. Investment in pesticides, mostly 'Ridomil plus' to control fungal attack attracted a mean value 0.87. This is not surprising as most of the farmers benefit from the government's cocoa mass spraying project.

Table 4. 8: Descriptive statistics of variables used in regression models

Variable	Definition of variables	Mean	S.d.
Dependent variables			
YIELD	Total output of cocoa per acre for the year 2012/2013	2.65	1.32
FERT	1 if cocoa farmer applies fertilizer, 0 otherwise	0.60	0.49
PEST	1 if cocoa farmer applies pesticide, 0 otherwise	0.87	0.33
Explanatory variables			
Tenure variables			
OWNER	1 if cocoa farm is under owner-operated system	0.07	0.26
CUSTOM	1 if cocoa farm is under customary land tenure system	0.51	0.50
SHARE	1 if cocoa farm is under sharecropping contract	0.42	0.49
Household characteristics			
GEND	Gender, 1 if farmer is a male, 0 otherwise	0.71	0.45
AGE	Age of cocoa farmer (in years)	45.71	11.62
EDUC	Years of formal education of cocoa farmer	7.00	4.36
HSIZ	Household size of farmer	6.37	3.43
MORG	1 if farmer is a member of a farmer-based group, 0 otherwise	0.42	0.49
OFMT	1 if farmer engages in off-farm activity, 0 otherwise	0.56	0.50
Farm characteristics			
FSIZ	Farm size (in acres)	7.91	5.72
FPAR	Number of cocoa farm parcels owned by farmer or several plots or farms	2.55	1.35
EXPR	Farming experience (in years)	19.66	10.45
FLAR	Number of farm labour	2.80	1.69
FDIS	Farm distance from homestead (in km)	3.37	3.10
CRDT	1 if farmer accessed credit, 0 otherwise	0.49	0.50
EXTN	1 if farmer received extension services, 0 otherwise	0.94	0.23

S.d denotes Standard deviation

Source: Author's Calculation from Field Survey (2014)

The mean age of cocoa producing household head was 45.71 years indicating that most of the farmers interviewed fall within the economic and productive age group with the average level of education 7.00 years (roughly, Junior High School). The mean household size was 6.37 persons. The average farm size in the district was 7.91 acres with a mean number of farm parcels being 2.55. This is as a result of population pressure and land fragmentation in the district. Most farmers interviewed in the district have had a lot of experience in cocoa production business, recording a mean value of 19.66 years. However, labour force in the cocoa sub-sector is low and expensive with a mean value of 2.80. This could be due to long distance to some of these cocoa farms. The mean distance of respondents' farm from homestead was 3.37 km. To overcome financial constraints in managing cocoa farms properly, most farmers engage in off-farm businesses. This variable recorded a mean of 0.56.

4.2.1 Empirical Results on the Effects of Land Tenure Types on Investments

To assess the relationship between land tenure and investment in cocoa farms in the district, the parameters of the investment equation were estimated. Two models were estimated for the investment equation. These were investments in fertilizer and pesticide. The probability of cocoa producing households' investments in the district was modelled as a function of land tenure, personal and household characteristics, basically, age, sex, and years of formal schooling of household head, variables capturing access to credit, as well as farm characteristics such as size of cocoa farm, farm parcel and distance of farm from home. Table 4.9 reports the estimates of the probability of cocoa producing households'

investments in the district. To measure the performance of the model, the Wald chi-square and p-value are reported. The chi-square statistics for the Wald was however 0.0004 indicating that each of the two models were significant at 1%. It can also be observed from the results that the estimated correlation coefficient between fertilizer and pesticide is positive and significantly different from zero at the 1% level of significance, indicating that unobserved variables involved in each investment option are significantly positively related, and confirms that it is more efficient to model fertilizer and pesticide jointly rather than separately. Therefore the null hypothesis that there is no relationship between fertilizer and pesticide was rejected and the alternative retained.

Table 4. 9: Bivariate probit estimates on investments in fertilizer and pesticide

Variable	Fertilizer			Pesticide		
	Marginal Effect	Standard Error	Z-value	Marginal Effect	Standard Error	Z-value
Constant	-1.2880	0.9541	-1.35	0.1131	0.9421	0.12
OWNER	3.8272	2.0143	1.90	0.2919	1.9461	0.15
SHARE	1.1546	0.8681	1.33	0.1111	0.8545	0.13
GEND	0.3738*	0.1286	1.71	0.2215	0.2150	1.03
AGE	0.0183*	0.0119	1.54	- 0.0009	0.0116	- 0.77
EDUC	- 0.0194	0.0240	- 0.81	- 0.0111	0.0236	- 0.47
FSIZ	- 0.0711***	0.0253	- 2.81	0.0861***	0.0276	3.12
FPAR	0.2900***	0.0912	3.18	- 0.2007**	0.0847	- 2.37
FDIS	- 0.0212	0.0433	-0.49	0.0326	0.0479	0.68
CRDT	- 0.4814	0.3253	-1.48	0.4761	0.3217	1.48
RESOWNER	- 3.1755	2.0356	-1.56	- 0.0199	1.9913	- 0.01
RESSHARE	- 0.5856	0.9009	- 0.65	0.0525	0.8758	0.06
Wald χ^2	51.52					
p-value	0.0004					
[illegible]	7.13***					

Observations	252

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%. RESOWNER and RESSHARE denote residuals from the first-stage regressions for owner-operated and sharecropping contracts respectively (Appendices A1 and A2) Source: Author's calculation (2014)

It is also important to note that the variables representing the residuals (RESOWNER and RESSHARE) derived from the first-stage regressions for tenure types are not statistically significant at any levels, even 10%, indicating no simultaneity bias between land tenure and investment, and that the coefficients have been consistently estimated (Brasselle *et al*., 2002; Wooldridge, 2002).

The variable representing owner-operated had positive effect on fertilizer and pesticide but was not significant at any level, even 10%. The insignificant value indicates that given the reference dummy category, OWNER category does not influence investment in fertilizer and pesticide at any significant level than that of the base category (CUSTOM). Therefore the hypothesis that owner-operated tenure exerts positive effect on investments in fertilizer and pesticide is accepted and the alternative rejected. Inconsistent with theory, the investment variables for sharecropping are positive and are not statistically significant at even 10% level. As indicated earlier, *Abunu* tenants are responsible for all the tasks including fertilizer and pesticide application. However, *Abusa* tenants manage already established cocoa farms and receive some assistance in the form of fertilizer and pesticides from the landlords. This clearly indicates that fertilizer and pesticide are used almost equally on sharecropping farms as in owneroperated cocoa farms in the district. The study therefore rejects the hypothesis that sharecropping land tenure systems exert negative effects on investments in fertilizer and pesticide and accepts the alternative.

The effect of gender on fertilizer and pesticide was positive. The variable gender however statistically significant at10% for fertilizer but was not significant at even 10% level for pesticide. The result indicates that more males are likely to apply fertilizer than their female counterparts. The effect of age on fertilizer is positive and significant at 10% level. But the effect of age on pesticide was negative and not significant at any level. This result could be due to the fact that older farmers were likely to be relatively reluctant in their decisions to take up new technologies such as application of fertilizer and pesticide in their cocoa farms because of their short planning horizon. However, it is also true that older farmers were likely to have more farming experience and would therefore be likely to be more receptive to new technologies (Wagayehu and Lars, 2003). On the other hand, younger farmers would be more accommodative to new ideas and would invest in new and long term innovations. The effect of education on fertilizer and pesticide was expected to be positive; it however picked a negative sign. It was also observed that none of the investment options was statistically significant at even 10%

level.

It also came to light that farm size had negative effect on fertilizer and statistically significant at 1%. This result suggests that smaller farms get better investment into fertilizer as opposed to bigger farms. Also, the bulky nature of fertilizer hinders its application in bigger cocoa farms. Farm size on the other hand had a positive influence on pesticide and was significant at 1% level. This result indicates that relatively large farms size holders are likely to apply pesticide. This empirical finding is consistent with Otsuka and Place (2014) that population pressure has exhausted uncultivated land and reduced farm size leading to

intensification of farming systems, which require investments. Farm parcel had a positive effect on fertilizer and was statistically significant at 1% level. On the other hand, farm parcel recorded a negative effect with pesticide at 5% significance level. This is expected. As the number of farm parcels of a farmer increase, the attention and care given to proper farming practices reduces drastically, affecting adoption of improved technologies and maintenance of existing investments. This finding is consistent with Nkamleu *et al*. (2007) study in Côte d'Ivoire that adoption or investment in agrochemicals is less for farmers with several plots or farms. The result of farm distance from the homestead with fertilizer gave a negative relationship without being significant at even 10% level. However, farm distance from home had positive effect on pesticide and also not significant at any conventional level. It is believed that farmers with farms that are within residential area were expected to have higher probability of adopting variety of investment portfolios to better their lots. Moreover, farmers in the district live within a mean distance of 3.37 km from their farms. This has given them the opportunity to pay more attention to nearby farms with less care to distant farms from the homestead, hence the mixed results. Another important variable which affects investment in the cocoa sub-sector is credit. The effect of credit on fertilizer was negative and not statistically significant at even 10%. This could be linked to lack of collateral or security to secure the credit due to insecure land tenure systems, especially the customary land tenure prevailing in the district. On the other hand, the effect of credit on pesticide was positive. The variable credit was however not statistically significant at any level. This is inconsistent with the study of Opoku *et al*. (2009) in Ghana which points out that credit led to increment in the

application of farm inputs, including pesticide.

4.2.2 Empirical Results on the Effects of Land Tenure and Investments on Cocoa Productivity

Table 4.10 reports the estimates on the effects of land tenure types on productivity of cocoa. To measure the performance of the model, the R-squared (R^2) and F-statistics are reported. Given the potential endogeneity of investments in fertilizer and pesticide in cocoa production, the determinants of investments in fertilizer and pesticides were first estimated (Appendices A3 and A4). The predicted residuals for fertilizer (RESFERT) and pesticide (RESPEST) were then used in the cocoa productivity specification.

Ownership of land (OWNER) is expected to exert a positive influence on cocoa productivity. The empirical result rather shows a negative effect on cocoa productivity at 1% significant level. This empirical result suggests that land ownership in the district is not all that secured as one is exposed to all forms of tenure insecurity and conflict. As pointed by Deininger and Castagnini (2006), presence of land conflicts had a debilitating effect on agricultural productivity in the order of reducing it by half on disputed plots. It was not surprising that the variable for sharecropping (SHARE) is negative and significant at 5%. This could be due to the fact that most of the farmers in sharecropping contracts are migrants and do not have the financial muscle to commit a lot of resources into the management of the cocoa farm, although they get some resource assistance from the landlords. As expected, fertilizer and pesticide application both had positive effects on cocoa productivity with both of them being statistically significant at 1% level. The results indicate the premium cocoa farmers place on fertilizer and pesticide, as they play a major role in the realization of the cocoa beans. It is significant to note that application of fertilizer and pesticide renews the

soil of old cocoa farms and reduces the level of pests and diseases respectively at the farm level.

Table 4. 10: OLS estimates on the effects of land tenure and investments on cocoa productivity

Variable	Coefficient	Standard Error	t-value
Constant	-16.8921***	5.3825	- 3.14
OWNER	- 5.7047***	1.5140	- 3.77
SHARE	- 2.0879***	0.8066	- 2.59
FERT	11.4685***	3.5936	3.19
PEST	21.4436***	5.7999	3.70
GEND	-1.9276**	0.7602	- 2.54
AGE	- 0.0123	0.0149	- 0.83
EDUC	0.2216***	0.0696	3.18
HSIZ	0.6803***	0.1839	3.70
FSIZ	- 0.3717***	0.0837	- 4.44
CRDT	- 4.0979***	0.9117	- 4.49
MORG	0.0543	0.2613	0.21
EXTN	1.1470***	0.4956	2.97
FDIS	- 0.0203	0.0251	- 0.81
EXPR	0.0105	0.0127	0.82
RESFERT	- 11.5172***	3.5960	- 3.20
RESPEST	- 21.7519***	5.7999	- 3.75
F-statistics	9.89		
p-value	0.0000		
R-squared	0.4024		
Observations	252		

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%. RESFERT and RESPEST denote residuals from the first-stage regressions for fertilizer and pesticide respectively (Appendices A3 and A4) Source: Author's calculation (2014)

Gender had a negative effect on productivity and was significant at 5% level. This shows that the females are having less influence on cocoa productivity in the district. Age had

negative effect on productivity and statistically insignificant at even 10% level. With a mean age of 45.71 years (Table 4.8), it implies that as the age of cocoa producing household head increases, productivity also decreases. Thus, older farmers are gradually taking over the cocoa production business with obsolete production technologies while the young ones are craving for white collar jobs in the big towns. Education on the other hand recorded a positive effect on productivity and statistically significant at 1%. This could be explained by the fact that the level of education in terms of number of years spent in school of the respondents was high with a mean value of 7.00 years (Table 4.8). One major determinant of cocoa yield, household size had a positive effect on productivity and significant at 1% level. The reason could be that poor resource farmers depend solely on family labour to maintain their farms. In the model also, the effect of farm size on productivity was negative and statistically significant at 1% level. This negative sign of farm size with productivity could be due to small farm holdings in the district with as low as 7.91 acres (Table 4.8) as the mean. This confirms the empirical findings of Kiani (2008) who found negative but insignificant correlation between output per cultivated acre and farm size. Also, land fragmentation among family members in the district might have accounted for the negative sign. As the number of farm parcels of a farmer increase, the attention and care given to proper farming

practices reduces drastically, affecting productivity.

By injecting capital into agriculture, it is possible to increase the rate of agricultural development since credit has frequently been considered as one of the main factors in overcoming agricultural stagnation that helps to expand farmland size and production

(Olagunju, 2007). However, credit had a negative effect on productivity and was significant at 1% level. The negative sign implies there is low or lack of credit use among the farmers interviewed. As pointed out by Olagunju (2007) credit facilities as well as the use of agricultural capital and labour resources accelerate adoption process and expand the scale of production and moreover, facilitates an increase in resource productivity. Membership of farmer-based organization took a positive sign and was not significant at even 10% level. This indicates high level of group membership among the respondents. This has been one of the factors contributing to high cocoa productivity in the district as groups (for example, Cocoa *Abrabopa*) provide all the necessary support in the form of finance and technical advice to increase production. Extension variable also took a positive sign and statistically significant at 1% level indicating a high level of information dissemination on proper cocoa production technologies and management practices by extension officers in the district. Farm distance from the homestead had a negative effect on productivity and not significant. The negative influence can be attributed to the fact that most of the farmers interviewed operate within a mean distance of 3.37 km (Table 4.8). This is a disincentive to application of inputs such as fertilizer and pesticides and high cost of production, which in the final analysis affects productivity negatively. Experience in cocoa farming had a positive effect on cocoa productivity but not statistically significant. This could be due to the high mean value of

19.66 years (Table 4.8) of experience in farming recorded.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter is made up of four main sections. The first section presents a summary of findings of the study. The second part provides the conclusions based on the findings with the third part giving recommendations for policy directions. Finally, the chapter concluded

with discussion on limitations of the study and made suggestions for future research in the Bibiani-Anhwiaso-Bekwai District.

5.1 Summary of Findings

Three main land tenure arrangements were identified in the study area. These are owneroperated (7%), customary land tenure (51%) and sharecropping (42%). Under the owner-operated system, the landholder has full property rights over the land or farm being cultivated. With customary land tenure, land is communally owned and has it highest interest traceable to a stool, skin, clan or family. Hence under the customary land tenure, land is inalienable and the living must use the land so that the interests of the future unborn generations are not jeopardized. Under a sharecropping contract, an arrangement is made between the landlord and the operator or tenant, such that part of the output is given to the landlord as compensation for using the land. Two forms exist in the study area. *Abunu* (96.2%) is where tenants are responsible for all the tasks (clearing land, establishing cocoa farms, weeding, spraying and harvesting) and in return receive a half share of the cocoa harvest. And *Abusa* (3.8%), where tenants manage already established cocoa farms and in return get one-third and the landowner takes two-

third.

The empirical results on investment options showed that both owner-operated and sharecropping land tenure systems had positive effects on fertilizer and pesticide. This suggests that farmers operating both owner-operated and sharecropping cocoa farms are likely to invest more into fertilizer and pesticide to increase yield. Statistically however, there is no difference in the levels of impact between the two land tenure forms. The results

also revealed that both gender and age had positive effects on fertilizer. It also came to light that farm size had negative effect on fertilizer. Farm size on the other hand had a positive influence on pesticide. The result further revealed that farm parcel had a positive effect on fertilizer. On the other hand, farm parcel recorded a negative effect with pesticide. Finally, the empirical results on productivity revealed that owneroperated tenure, one of the key factors in determining cocoa productivity in the district had a negative effect on productivity. It was not surprising that sharecropping had a negative effect on productivity. The major investments in cocoa production, fertilizer and pesticide application both had positive effects on cocoa productivity. The results indicate the premium cocoa farmers place on fertilizer and pesticide, as they play a major role in the realization of the cocoa beans. Both gender and age influenced productivity negatively. Education on the other hand recorded a positive effect on productivity. One major determinant of cocoa yield, household size had a significant positive effect on productivity, as poor resource farmers depend solely on family labour to maintain their farms. It was also revealed that the effect of farm size on productivity was negative. However, credit had a negative effect on productivity indicating low or lack of credit use among the farmers interviewed. Extension also took a positive sign, suggesting a high level of information dissemination on proper cocoa production technologies and management practices by extension officers in the district.

5.2 Conclusions

The study analysed the relationship between land tenure and investment as well as the relationship between land tenure and cocoa productivity in the Bibiani-AnhwiasoBekwai District. The study revealed that owner-operated, customary land tenure and sharecropping

are the three main land tenure arrangements in the district, with customary land tenure forming the majority. Under the sharecropping contract, *Abunu* and *Abus*a were identified. High level of customary land tenure systems in the district reinforce high land tenure insecurity in the district. The empirical results on investment revealed that owner-operated and sharecropping land tenure systems had positive effect on fertilizer and pesticide. This suggests the importance cocoa farmers attach to fertilizer and pesticide as they improve on yield. Both gender and age having positive effect on fertilizer implies that more men are likely to use fertilizer as well as those in old age bracket. The positive influence of farm size on pesticide clearly indicates the level of investments farmers make on big cocoa farms in terms of pesticide. Finally, owneroperated tenure, one of the key factors in determining cocoa productivity in the district had a negative effect on productivity. This could be a sign of insecurity or disputes over land ownership in the district and can militate against cocoa productivity. It must be noted also that fertilizer and pesticide application both had positive effects on cocoa productivity. This is a good sign to the cocoa industry as farmers are aware of the role fertilizer and pesticide play in cocoa production in the district. This is as a result of the role extension officers play in information dissemination on the right approach farmers should adopt in cocoa production.

5.3 Policy Recommendations

Customary land tenure and land tenure insecurity has been a major source of lack of investment in the cocoa sub-sector in the district. In order to improve on land tenure security to enhance investment and productivity, some policy instruments must be implemented by

the Bibiani-Anhwiaso-Bekwai District and other stakeholders in land, investment and cocoa industry. Based on the study findings, the following recommendations must be pursued:

(1) The customary land tenure system forming the majority of land tenure systems in the district is characterised with insecurity. This insecurity could be minimised through formal land ownership and registration. The registration process should be able to remove all institutional bottlenecks to enhance individual tenure security to facilitate investment in cocoa farms and for higher productivity.

(2) Traditional authorities and family heads in charge of customary lands should be mindful of community and family land boundary demarcation before allocating lands to their subjects. Disregard for boundaries on the part of these authorities has been a source of conflict between communities and even family members. As population pressures continue to grow, the incidence and severity of boundary dispute is liable to increase, and this is a potential to reducing investment drive in the district.

(3) Since fertilizer and pesticide application had improved among owneroperated and sharecropping farmers in the district, provision of cocoa fertilizer on credit under the Cocoa Hi-Tech Project and spraying of cocoa farms under the Cocoa Mass Spraying Project by the government should be revisited to increase yield.

(4) The effect of credit on productivity was negative, indicating low or lack of credit use among the cocoa farmers. Any programme geared towards advancing credit to these farmers to purchase inputs such as fertilizer and pesticide will be in the

right direction to improve on cocoa productivity. This will also go a long way to reduce poverty among cocoa households.

(5) The continual use of fertilizer and pesticide by the cocoa farmers to increase cocoa productivity will require a huge investment into the establishment of agrochemical industry in the district to produce these inputs at an affordable price.

(6) Education on the need to use the right fertilizer and pesticide for cocoa should be done by agricultural extension officers. This will prevent any possibility of the final produce (cocoa beans) being rejected at the world market for containing high residue of agrochemicals.

5.4 Limitations of the Study and Suggestions for Future Research

This study was mainly based on assessment of impact of land tenure systems on cocoa productivity in the Bibiani-Anhwiaso-Bekwai District. The limitations of the study were on resource and time constraints. Due to resource and time constraints, only 252 cocoa producing households were sampled for the study even though more than 300 respondents were initially considered. For the purpose of comparability, the study can be replicated in the Bibiani-Ahwianso-Bekwai District or new cocoa districts using a larger sample size (for example 500 respondents), different data collection methods (for instance, taking data at different times of the year) and analytical tools and results compared. For instance, analytical tools such as Cost-Benefit analysis could be used to test the viability of

the investment options and Cobb-Douglas production function to investigate the behaviour of the variables on cocoa productivity in the district.

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APPENDICES

A1: First-stage Regression Estimates of Owner-operated Tenure

Variable	Coefficient	Standard Error	t-value
Constant	0.5346***	0.0976	5.48
GEND	- 0.0878**	0.0355	-2.47
AGE	- 0.0138***	0.0024	-5.67

EDUC	0.0012	0.0037	0.33
HSIZ	0.0008	0.0052	0.15
FSIZ	- 0.0045	0.0032	-1.40
EXPR	0.0126***	0.0026	5.11
FDIS	0.0050	0.0052	0.97
CRDT	0.0916***	0.0322	2.85
OFMT	- 0.1028***	0.0327	-3.14
MORG	0.0092	0.0339	0.27
EXTN	- 0.0043	0.0663	-0.06
F-statistics	7.07		
p-value	0.0000		
R-squared	0.2447		
Observations	252		

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%.
Source: Author's calculation (2014)

A2: First-stage Regression Estimates of Sharecropping Tenure

Variable	Coefficient	Standard Error	t-value
Constant	0.0239	0.1818	0.13
GEND	0.1019	0.0661	1.54
AGE	0.0219***	0.0045	4.85
EDUC	- 0.0131*	0.0069	-1.88
HSIZ	- 0.0113	0.0097	-1.16
FSIZ	- 0.0022	0.0061	- 0.37
EXPR	- 0.277***	0.0046	- 6.02
FDIS	0.0263***	0.0097	2.71
CRDT	0.1146	0.0599	1.91
OFMT	0.0960	0.0611	1.57
MORG	0.1533**	0.1236	2.42
EXTN	- 0.2339*	0.1236	-1.89
F-statistics	8.69		
p-value	0.0000		
R-squared	0.2848		
Observations	252		

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%.
Source: Author's calculation (2014)

A3: First-stage Regression Estimates of Fertilizer

Variable	Coefficient	Standard Error	t-value
Constant	0.7558***	0.2048	3.69
GEND	0.0475	0.0742	0.64
AGE	0.0021	0.0033	0.63
EDUC	- 0.0069	0.0077	- 0.89
HSIZ	- 0.0131	0.0117	-1.12
FSIZ	- 0.0203***	0.0072	-2.80
FPAR	0.0749**	0.0288	2.60
FLAR	0.0111	0.0243	0.46
CRDT	0.0116	0.0681	0.17
OFMT	- 0.1163*	0.0697	-1.67
MORG	- 0.0540	0.0713	- 0.76
EXTN	- 0.2189	0.1376	-1.59
OWNER	0.2331*	0.1296	1.80
SHARE	0.1408*	0.0658	2.14
F-statistics	2.55		
p-value	0.0026		
R-squared	0.1224		
Observations	252		

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%.
Source: Author's calculation (2014)

A4: First-stage Regression Estimates of Pesticide

Variable	Coefficient	Standard Error	t-value
Constant	0.4816**	0.2016	2.36
GEND	0.0955	0.0731	1.31
AGE	0.0000	0.0033	0.01
EDUC	- 0.0069	0.0075	- 0.92
HSIZ	- 0.0223*	0.0115	-1.93
FSIZ	0.0272***	0.0071	3.81
FPAR	- 0.0459	0.0284	-1.62
FLAR	- 0.0128	0.0239	- 0.54
CRDT	0.1529**	0.0671	2.28
OFMT	0.0537	0.0686	0.78
MORG	0.0044	0.0702	0.06
EXTN	0.0675	0.1355	0.50
OWNER	0.1074	0.1276	0.84
SHARE	0.0527	0.0648	0.81
F-statistics	2.79		
p-value	0.0010		
R-squared	0.1324		
Observations	252		

*** Denote significant at 1%, ** denote significant at 5%, * denotes significant at 10%.
Source: Author's calculation (2014)

A5: Survey Instrument

Section A: Household Characteristics

1.Name of respondent_____

2. Gender; ☐ a.Male ☐ b.Female

3. Ethnicity: ☐ aAkan ☐ b. Ewe c. ☐ Ga d. ☐ Northerner

e. Others, specify _____ 4. How old are you? _____

5. Marital status: a. ☐ Single b. ☐ Married c. ☐ Divorced d. ☐ Widowed e ☐ Separated

6. What is your level of education?

b. ☐

f. ☐

a. ☐ None Primary c. ☐ Junior ☐ High d. Middle School
e . ☐ ☐ University
Senior High College/Polytechnic g.

7. Your family or household size _____
8. Your cocoa farm size (in acres)? _____
9. How many bags of cocoa beans did you realise last harvest season or year

_____

10. How many farm parcels do you have? _____
11. How many years have you been farming? _____
12. How many workers do you have on your farm, including your household labour?

_____

13. How much do you spend on labour per year? Gh¢_____

14. What inputs have you been using in your farm?

a. ☐ Fertilizer, b. ☐ Pesticides, c. ☐ Spraying machine
d. Others, specify_____

15. Cost of bag of cocoa fertilizer per year? Gh¢ _____

16. Do you experience fungus attack? a. ☐ Yes b. ☐ No
17. If yes, how do you prevent the effect of fungus attack?

_____

18. Could you please give the cost of fungicide/insecticide per acre of cocoa farm peryear?

Gh¢_____

19. How far is your farm from your household? _____

Section B: Economic Factors

20. What is your source of finance or credit in your cocoa farming activity? a. ☐ Saving
b. ☐ Friends c. ☐ Local money lender d. ☐ Bank e. Others, specify_____
21. If not savings, what amount of credit do you get last cocoa year? Gh¢_____

22. Are you engaged in any off-farm employment or activity? a. ☐ Yes b. ☐ No

23. If yes, which of the following do you engage in?

a. ☐ Petty Trading b. ☐ Civil servant c ☐ Seamstress/ Tailor d. ☐ Artisan work e. Others, specify _____

24. How much do you earn from off-farm employment and/or remittances from wellwishers per year? Gh¢ _____

Section C: Institutional Factors

25. Do you own the land you cultivate on? a. ☐ Yes b. ☐ No

26. If yes, how did you acquire the land?

a. ☐ Purchased b. ☐ Inherited c. ☐ Given d Others, specify _____

27. Do you have a title or registered your land? a. ☐ Yes. b, ☐ No

28. If no, what type of land tenure are you engaged in?

a. ☐ Statutory land b. ☐ Customary land c. ☐ Sharecropping d. ☐ Fixed Rent, Others, specify _____ 29.

If sharecropping, which of these? a. ☐ Abunu b. ☐ Abusa c. ☐ Nkotokoanu d. Others, specicfy _____ 30.

If customary land tenure system, what rights do you have over the land you cultivate?

a. ☐ User Rights, b. ☐ Transfer Rights, c. Others, specify _____

31. If Transfer Rights, which of these do you enjoy on your land?

a. ☐ Right to sell with approval, b. ☐ Right to sell without approval, c. Others, specify, _____

32. What investments you have made in your cocoa farm?

☐ a. Soil and water conservation b. ☐ Rehabilitation c. ☐ Expansion of farm

☐ d.Construction of farmhouse ☐ e.Purchase of farm equipments

f. Others, specify _____

33. Have you had any incidence of dispute over the land you cultivate for the last

seasons or years? a. ☐ Yes b. ☐ No

34. If yes, what land dispute were you confronted with? Could you highlight on some ofthem.

_____

_____

35. What is your source of information on best cocoa farming practices on your farm?

a. ☐ Extension agent b. ☐ 3. Fellow farmers' c. ☐ Farmer groups d. ☐ Media ☐ . e.Research Institutions f. Others, specify _____ 36. How often do you have access to information or frequency of extension agent visit?

a. ☐ Everyday ☐ b. Weeklyc. ☐ Fortnightly d. ☐ ☐ Monthly f. ☐

e.QuarterlyYearly g. Others, specify _____

37. Do you belong to any organization or farmer group which provides information oncocoa production ☐ management practices? a Yes b. ☐ No

38. If yes, which group do you belong to? a.District Farmers Association

b. ☐ Cocoa Abrabopa c. ☐ District Cocoa Farmers Association d. ☐ Local Farmer Group

e. Others, specify_____

39. What assistance do you get from the organization or group that you belong to?

a. ☐ Financial assistance b. ☐ Provision of farm inputs c. ☐ Technical assistance

d. Others, specify_____

40. Apart from farmer-based organizations or groups, do you belong to any other local group?

a. ☐ Yes, b. ☐ No

41 If yes, which local group? _____

42. Have you held any leadership position in any of the local organization or groups in the district? a. ☐ Yes b. ☐ No

43. If yes, what position did you hold? _____

44. What were some of your responsibilities? _____

Section C: Cocoa Productivity Factors

How do you agree or disagree with the following cocoa productivity factors and how they affect cocoa production in the district?

S/N	Variable	Strong agree	Agree	Uncertain	Disagree	Strong Disagree
45	Land tenure issues					
46	Government interventions					
47	Hi-tech /mass cocoa spraying projects					
48	Best agronomic practices					
49	Additional land cultivated in a year					
50	Variety of cocoa grown					
51	Post harvest losses in a year					
52	Small scale mining / 'Galamsey' menace