YOUTH PARTICIPATION AND PRODUCTIVITY IN COCOA FARMING IN THE WESTERN NORTH COCOA REGION OF GHANA

BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN AGRICULTURAL ECONOMICS

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DECLARATION

I, Emile Mawutor Tsekpo, the author of this thesis hereby declare that except for the references which have been duly cited, this thesis titled "YOUTH PARTICIPATION AND PRODUCTIVITY IN COCOA FARMING IN THE WESTERN NORTH COCOA REGION OF GHANA", was entirely done by me at the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon from August 2017 to July 2018. This thesis has never been presented or published either in whole or in part for any other degree in this University or elsewhere.

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This thesis has been presented for examination with our approval as supervisors:

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DEDICATION

This work is dedicated to Philemon Tsekpo, Comfort Donkor, Cecilia Addai and Otis Tsekpo.

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ABSTRACT

This study examined youth participation and productivity in cocoa farming in the Western North Cocoa Region of Ghana using primary data from 958 respondents through the field assistance of Solidaridad West Africa. Systematic and purposive sampling techniques were used to sample 588 youth (<35years) and 370 adults (>35years) from Sefwi Bekwai, Boako, Akontombra, Bodi and Asempaneye. Descriptive statistics were used to describe the distribution in the roles played by the youth in cocoa farming in the study area. The Kendall's coefficient of concordance was used to rank cocoa farming labour services the youth viewed as profitable. A probit regression model was used to assess the factors that influence cocoa farm ownership by the youth in the study area. The STATA 14 software was used in running the various regressions. The Total Factor Productivity Index Program (TFPIP) was used to compute Törnqvist total factor productivity indices. The Törnqvist total factor productivity index was used to compare total factor productivity indices between youth and adult farmers. The computed TFP index was further used as a dependent variable in a Tobit regression model to analyse the determinants of productivity in cocoa farming in the study area. It was observed that although the youth are active participants in cocoa production, various socioeconomic, technical, and institutional factors constrain their productivity. The results showed that most of the youth in the region were engaged in cocoa farming as either family labourers (48.98%) or farm owners (34.52%). The rest were engaged as hired farm labourers (7.82%) or caretakers (8.67%). Results from the Kendall's coefficient of concordance showed that hired farm labourers viewed harvesting of cocoa pods as the most profitable labour service whiles caretakers viewed farm management as the most profitable labour service in the region. Estimates from the probit regression model showed that access to land, access to credit, willingness of youth to farm cocoa, profitability of non-farm employment to cocoa farming, profitability of non-cocoa farming to cocoa farming, perception of cocoa farming as a future venture, sex and education significantly determined cocoa farm ownership by youth in the region. Also, a comparison of the total factor productivity indices showed that adult cocoa farmers were more productive than the young cocoa farmers. Furthermore, estimates from the Tobit regression model showed that FBO membership, the use of cocoa hybrid seeds and age of cocoa farm significantly influence productivity in cocoa farming in the region. The study recommends that the Ghana Cocoa Board (COCOBOD) and other agriculture related NGO's intensify collaborations to encourage youth in cocoa growing regions to consider cocoa farming as a sustainable employment venture. These institutions should also liaise with community opinion leaders to facilitate access to land for cocoa farming for the youth in the region. Also, the Ghana Cocoa Board (COCOBOD) should partner with microfinance institutions in the region to provide collateral-free and low interest loans for registered and profiled youth who are willing to farm cocoa. Finally, the Ghana Cocoa Board (COCOBOD) and agricultural extension agents in the various districts should train farmers on good cocoa agronomic practices to help increase their productivity.

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AfDB	African Development Bank
COCOBOD	Ghana Cocoa Board
CODAPEC	Cocoa Disease and Pest Control Program
CRC	Convention on the Rights of the Child
DEA	Data Envelopment Analysis
FBO	Farmer Based Organisations
IFAD	International Fund for Agricultural Development
OECD	Organisation for Economic Co-operation and Development
PFP	Partial Factor Productivity
PFJ	Planting for Food and Jobs
SWVMFP	South Western Victorian Monitor Farm Project
TFP	Total Factor Productivity
TFPIP	Total Factor Productivity Index Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
WNCR	Western North Cocoa Region
YCF	Youth in Cocoa Farming
YIAP	Youth in Agriculture Program

CHAPTER ONE

INTRODUCTION

1.1 Background

The concern for youth in agriculture revolves around two major issues (Sumberg *et al.*, 2012). The first is how the skills and potential of the youth can be harnessed to salvage the prospects of the agricultural sector. The second issue is how young people can venture into agriculture as a major employment avenue. Each of these perspectives are influenced by socioeconomic, technical and institutional factors.

The issue of youth venturing into agriculture to improve the sector is centred on the interests and aspirations of the youth. Anyidoho *et al.* (2012) attributes the decision of rural youth to venture into agriculture to personal beliefs, social pressures and institutional opportunities and constraints. According to Juma (2007), farming as a career does not appeal to most youth due to perceptions of drudgery and low social prestige. In Ghana, low productivity and income levels associated farming influence young people's decision to consider farming as a career (Anyidoho *et al.*, 2012).

The issue of agriculture serving as a viable employment avenue for the youth is advocated by agricultural policies, initiatives and programmes that highlight the growth and employment potential of the agricultural sector. Various youth in agriculture and related policies in Africa provide diverse reasons why African youth must consider farming as a viable employment venture (Sumberg *et al.*, 2012). According to te Lintelo, (2012), although policy documents make strong assertions about the aspirations of African youth when advocating for their participation in agriculture, they fail to equip them with access to productive resources. As a result, the youth are constrained in decision making and resource allocation.

Cocoa farming remains an untapped potential for developing gainful employment for unemployed Ghanaian youth (Laven & Boomsma, 2012). Empowering the youth to venture into agriculture has been the focus of agricultural initiatives and programmes by the Ghanaian Ministry of Food and Agriculture and various agriculture related projects by non-governmental organisations.

Low cocoa productivity levels in Ghana have been attributed to the aging cocoa farmer population in Ghana. According to Akudugu *et al.* (2012), aged farmers find it difficult to adopt new technologies since they accumulate a lot of farming experience through observation and experimentation and hence are unwilling to abandon these experiences for new technologies. Also, ageing farmers' perception that new technologies require a lot of time to yield required results make them lose interest in adopting such technologies. The possibility of most aged farmers not living long enough to enjoy the benefits of new technologies deter them from adopting them.

With the focus of global agriculture shifting towards sustainable production, there is a need for intensive technology adopting farmers who are willing to increase productivity whiles ensuring climate smart agricultural practices (Laven & Boomsma, 2012). Providing support for willing youth to venture into sustainable agriculture can go a long way to tackle the issue of youth unemployment and also enhance the prospects of the agricultural sector. However, there is a need to formulate and implement relevant policies to facilitate proper youth participation in cocoa farming for the desired productivity increase to be realised.

1.2 Problem Statement

Ghana is the second highest cocoa producer in the world. Between 2003 and 2011, cocoa production in Ghana doubled from 500,000 tonnes to about 1,000,000 tonnes (Asante-Poku & Angelucci, 2013). Despite the increase in production over the years, productivity levels of smallholder cocoa farmers remain low (Laven & Boomsma, 2012). Also, over 85% of smallholder cocoa farmers are low technology adopters and hence only about 15% are able to produce more than 650 kg/ha annually (Asante-Poku & Angelucci, 2013). However, policy makers expect future cocoa production to be characterised by a smaller group of more productive and innovative cocoa farmers who are willing to invest in and adopt new technologies to increase productivity (Laven & Boomsma, 2012).

The youth have been identified as productive farm managers that can sustainably adopt modern farm practices and increase national productivity levels. According to Omoti (2012), about 70% of African youth that live in rural areas are somewhat engaged in agriculture and they account for about 65% of the rural agricultural workforce. However, only few of the youth engaged in agriculture manage their own farms (AfDB *et al.*2012). Most of the youth involved in agriculture are either engaged as casual agricultural labourers on people's farms or are used as family labourers on their parents' farms (Bezu and Holden, 2014). According to Anyidoho *et al.* (2012), the diverse nature of rural youth aspirations influences their decision to factor farm ownership into their short and long-term livelihood strategies.

The youth represent about 18% of the world's population and this proportion is fast growing in poor and developing nations (IFAD, 2014). In these countries, the youth are plagued with dismal employment prospects and poor-quality jobs. Also, the high youth population growth rate is making it difficult for the issue of global youth unemployment

to be resolved (Engelman *et al*, 2014). Despite the agricultural sector's potential to reduce unemployment and provide sustainable employment opportunities, it remains unattractive to the rural youth. Furthermore, issues of credit access and rising cost of farming inputs keep affecting the productivity of the young farmers (Omoti, 2012).

Over the past few decades, there have been an increase in youth oriented agricultural programmes and initiatives in Ghana. Noticeable among these are the Youth in Agriculture Programme and Planting for food and Jobs by Ministry of Food and Agriculture. Also, there are programmes such as the Youth in Cocoa Farming Programme, Cocoa Mass Spraying Programme and the Cocoa Hand Pollinators programme which are being spearheaded by Ghana Cocoa Board. The shift in policy focus can be attributed to rising levels of youth unemployment and low productivity of ageing farmers in Ghana (Laven and Boomsma, 2012).

To provide information, among others for further efforts in policy and related areas of intervention, this study seeks to address the following questions;

1. What is the distribution in the roles played by the youth in cocoa farming in the Western North Cocoa Region?
2. What factors influence cocoa farm ownership by the youth in the Western North Cocoa Region?
3. What are the determinants of productivity and how does the productivity of youth compare to that of adults in cocoa farming in the Western North Cocoa Region?

1.3 Research Objectives

The main objective of this study is to examine youth participation and productivity in cocoa farming in the Western North Cocoa Region. This is achieved through the following specific objectives:

1. To identify and describe the roles played by the youth in cocoa farming in the Western North Cocoa Region.
2. To assess the factors that influence cocoa farm ownership by the youth in the Western North Cocoa Region.
3. To analyse the determinants of productivity and compare youth and adult total factor productivity in cocoa farming Western North Cocoa Region.

1.4 Relevance of Study

The complex nature of the Ghanaian cocoa sector has made it difficult for policies aimed at increasing productivity of cocoa farmers to yield expected results. Complex combinations of socioeconomic factors such as ageing farming population and low technology adoption makes it difficult for policy makers to define a clear group for policy targeting.

The introduction of policies such as the Cocoa Rehabilitation Scheme (CORIP), Cocoa Disease and Pest Control Program (CODAPEC), the Hi-Technology Programme, Cocoa Mass Spraying Exercise, Mass pruning exercise, Cocoa Hand Pollination Exercise, Fertilizer Subsidy programmes and distribution of free seedlings have been aimed at increasing the productivity of cocoa farmers in the country. However, sustained increase in productivity of smallholder cocoa farmers is yet to be realised.

With the introduction of youth-oriented programmes and initiatives such as the Youth in Agriculture Programme (YIAP), Planting for food and Jobs (PFJ), Youth in Cocoa Farming (YCF), Cocoa Mass Spraying Programme and the Cocoa Hand Pollinators programme, policy makers aim to attract a category of farmers who can efficiently manage cocoa farms and enhance the prospects of the agricultural sector as a whole. However, the youth are constrained by various socioeconomic and institutional factors that prevent them from owning cocoa farms. Also, inadequate support for young farmers prevents them from realising increased productivity.

Hence, an empirical analysis of practical issues associated with youth in agriculture will put the concept of youth in agriculture into perspective.

1.5 Organization of the thesis

This study is organized in five chapters. Chapter one introduces the study, highlights the problem being investigated and presents the research questions and objectives. Chapter two presents a review of literature on concepts related to the study topic. The third chapter describes the study area, conceptual framework, sampling approach, method of data analysis, theoretical framework and analytical framework. Chapter four presents the analysis and discussion of the study results. Finally, chapter five summarizes the key findings of the study, draw conclusions and provides policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents reviews of key concepts in this study. It highlights the concept of youth participation, issues of youth participation in agriculture, agricultural productivity and cocoa production in Ghana. Also, empirical studies conducted on these concepts are reviewed.

2.2 Youth Participation: Definition, Concept and Approach

Youth participation is defined as the active engagement and real influence of young people in adult agencies (Checkoway, 2011). It is often youth led and involves high levels of youth involvement. It recognizes the aspirations and abilities of young people by providing opportunities for them to actively contribute to decisions that affect them at the individual and systemic levels.

The need for effective youth participation have changed over the last three decades. According to Farthing (2012), earlier studies on youth participation laid emphasis on its relationship with global citizenship. This was largely due to the introduction of child right campaigns by the Convention on the Rights of the Child (CRC) in the late 1980's. A decade later, Schofield and Thoburn (1996) showed how youth participation could lead to improved services across various sectors. They explained how consulting the youth can bring about product and service innovation to meet changing global needs. Sinclair and Franklin (2000) broadened the scope of youth participation by highlighting its

desirability in terms of decision making, enhanced democratic process, skill acquisition, socioeconomic empowerment and the enhancement of self-esteem.

According to Checkoway (2011), the quality of youth participation is measured by its scope and quality. The scope of youth participation refers to the number of youth who engage in a given activity. The quality of youth participation is when the youth involved have real effect on the process, influence decision making and/or produce favourable outcomes.

For effective youth participation in social policies, the principles of best practice must be adhered to (Checkoway, 2012). These principles provide guidelines on how to involve the youth social, agricultural or political projects. The principles include visibility, diversity, equality, honesty, transparency, capacity building, Empowerment, choice, safe practice, high quality, respect and partnership.

2.2.1 Levels of Youth Participation

Hart (1992) propounded the ladder of youth participation. It assesses the concept of youth participation in the context of global citizenship. It serves as a blueprint for the various approaches of participation. According to Hart (1997), the ladder of youth participation describes the concept of youth participation in the scope of youth practice and policy. It proposes 8 levels of youth participation. The various levels of youth participation are described below.

Manipulation

It involves the direct use of youth by adults to champion adult-inspired agendas. Here, the youth are used by advocacy groups to put a message across. Although the advocacy

may be valid, the youth propagating the message have no understanding of the issue at hand. This is the first level of participation.

Decoration

This is the second level of youth participation. This is when adults use young people for activities that may have nothing to do with the youth involved. The youth are used to enhance the pageantry of such activities and events.

Tokenism

This is the third level of youth participation. Here, the youth are involved in youth related initiatives but their roles and options are limited. Their extent of participation is determined by the adults spearheading the process.

Assigned but informed

This is the fourth level of youth participation. Here, the youth are given special societal roles and have full knowledge of all procedures and activities. This level involves genuine participation of young people into socioeconomic initiatives.

Consulted and informed

This is the level of youth participation. It represents a higher level of social inclusion of the youth. Here, the youth's opinions and suggestions on vital issues are sought for. These opinions and suggestions are incorporated in projects that are designed and implemented by adults.

Adult-initiated, shared decisions with young people

This represents the sixth level of youth participation. Here, projects are designed and implemented by adults but opportunity is provided for the youth to actively participate in decision making. This is a form of participatory development approach.

Young people-initiated and directed.

This is the seventh level of youth participation. It involves youth-led activism. Here, the youth are given opportunity to design and implement initiatives whiles adults provide support services.

Young people-initiated, shared decisions with adults

This is the eight level of youth participation and it is the most desired. At this level, the youth lead project design and implementation of initiatives. However, adults are consulted for their opinions and suggestions. This represents maximum youth empowerment and participation.

2.3 The Youth, Unemployment and Agriculture

A youth is generally defined as a transition from a childhood dependence stage to an adulthood independence stage (UNESCO, 2012). However, different countries and organizations have different definitions for youth. These definitions are mostly based on socio-cultural and contextual considerations.

According to the United Nations, a youth is a young man or woman between the ages of 15 and 24 years of age (AfDB, 2014). The National Youth Policy of Ghana (2010) defines a Ghanaian youth as a young man or woman between 15 and 35 years of age. This

definition falls in line with that of the African Union (The African Youth Charter, 2006). The African Union's broader definition for youth be used for this study.

The UNDP (2014) describes the current 1.2 billion global youth population as the largest the world has ever known. Eighty-five percent (85%) of the world youth reside in developing countries with about 17% of them living in Africa.

As projected by IFAD (2014), the world's youth population is expected to increase to 1.3 billion by the year 2050 and this will be associated with limited employment and entrepreneurial opportunities for the youth living in economically stagnant areas in developing countries.

2.4 Determinants of Youth Participation in Agriculture

Despite the potential of the agricultural sector to serve as a source of alternative livelihood opportunities for the youth, issues of poor access to land, inadequate skills and poor access to finance continue to remain key factors that prevent the youth from effectively participating in agriculture (IFAD, 2014).

According to IFAD (2014), access to land is a major constraint for youth who seek to venture into agriculture as a source of livelihood. Apart from serving as the most important input, ownership of land marks the youth's identity, upgrades the youths' social status and enhances youth involvement in community decision making (Dalla Valle, 2012).

The difficulty of the youth in accessing land is largely due to prejudices and social attitudes towards the youth (IFAD, 2014). According to Kidido *et al.* (2017), the issue of youth access to land for agriculture is reinforced in typical agrarian communities where

parents, extended family heads and community leaders are in total control of land allocation and use. Since the main mechanism for accessing land is through inheritance, the youth in such communities have to wait for decades to inherit land to use for agricultural activities (IFAD, 2014). Moreover, the increase in life expectancy across all regions have further extended the waiting period for land inheritance. This long waiting period is likely to influence the youth's dislike for farming (White, 2012).

Furthermore, access to finance for agricultural activities continue to remain global determinant of rural youth participation in agriculture (IFAD, 2014). Rural youth who want to engage in agriculture need money to finance pre-planting, farm maintenance and post-harvest activities. As explained by Dalla Valle (2012), the high risk associated with rural agriculture deter the available financial institutions from providing loan for agricultural activities. Rural agriculture is mainly characterized by long production cycles, high dependence on rainfall, vulnerability to variable weather patterns, and dependence on natural resources and seasonality. Furthermore, the operating cost of financial institutions in rural areas is generally high due to scattered rural populations. Officials of financial institutions have to travel long distances to locate borrowers. Although the number of financial institutions is generally increasing in rural areas, youth involvement in the financial markets are limited due to the lack of youth friendly financial products (Dalla Valle, 2012). Also, according to (Grifoni and Messy, 2012), financial institutions classify youth as a high-risk category due to their lack of experience. This makes their access to credit for agricultural activities difficult.

2.5 Studies on Youth Participation in Agriculture

This sub-section presents reviews of studies conducted on youth participation in agriculture. It includes work on youth unemployment, rural youth aspirations, policy responses to the issue of youth in agriculture, youth access to productive resources, livelihood choices of rural youth, and migration motivation of rural youth.

2.5.1 Rural Youth Aspirations in Cocoa Farming

Using the cocoa sub-sector as a case study, Anyidoho *et al.*, (2012) examined the issue of rural youth in agriculture in context of their life aspirations and life choices. They assessed the nature and formation of young peoples' aspirations and its implication for future agriculture models. They also examined the diversity in youth aspirations in rural agricultural areas.

Through interviews and focused group discussions with 107 purposively sampled young people from 12 cocoa farming districts, they obtained information on youth perceptions and aspirations towards cocoa farming. They also assessed the circumstances under which they will consider cocoa farming as a primary or secondary occupation.

The study showed that although most young people were not interested in cocoa farming as a primary occupation, they recognize its importance and appreciates the opportunities they have gained by virtue of their parent's involvement in cocoa farming. Also, they observed that the various experiences and backgrounds of the youth in relation to cocoa farming inform the role of cocoa farming in their short-term and long-term aspirations.

2.5.2 Policy Responses to the Issue of Youth in Agriculture

Through a series of articles, Sumberg *et al.* (2012) examined policy framing and policy responses to the issue of youth and agriculture in Africa. They argued how opportunities for youth in agriculture can be broadly structured for different groups of young people at different times and in different places. They explained how these policies are hampered by a lack of historically informed, conceptually sound and context sensitive research and evidence. They also highlighted the existence of weak empirical researches in relation to the issue of youth in agriculture and its potential impacts on policy responses. These policy responses are mostly in the form of entrepreneurship training, targeted distribution of agricultural inputs, group farming schemes and farm mechanizations. They concluded by advocating for the use evidence-based research in framing youth in agriculture related policies.

2.5.3 Enhanced Youth Participation in Agriculture

Njeru (2017) examined the concept of youth in agriculture. Using a sample of 397 youth and 22 agricultural extension officers from the Kajiado North Sub-County, she assessed the perceptions and challenges for enhanced youth participation in agriculture. Structured questionnaires were administered to the respondents to provide appropriate responses. The youth responded to questions about their attitudes, perceptions and opinions about agriculture. According to the Likert analysis, absence of role models (18.1%), relatively low profitability of agriculture (17.6%), poor access to markets (15.8%), poor access to land (15.1%), poor access to credit (12.7%), drudgery (10.6%) and unattractiveness (10.1%) were the reasons the respondents felt deterred the youth from participating in agriculture. Additionally, majority (56.4%) of the respondents attributed non-participation in agriculture by the youth to the negative perceptions associated with farm work. A correlation analysis revealed a significant relationship between youth

perceptions of agriculture and their participation in agriculture since it dominantly influenced their participation in agriculture in the study area.

2.5.4 Employment and migration of rural youth

Using a sample of 640 households from 5 districts in southern Ethiopia, Bezu and Holden (2014) examined livelihood choices and migration of the rural youth.

The multinomial logit regression model employed in examining the livelihood choices showed that youth from households with large farm sizes, high household income and first-borns are more likely to consider on-farm employment. Also, youth who have higher education and those whose household heads are educated are likely to engage in off-farm self-employment rather than farming.

Additionally, the results showed that females are more likely to engage in urban salaried employment than farming. Furthermore, married youth prefer farming to urban salaried employment

A probit model was used to analyse the factors that influence rural youth migration. Estimates from the probit model showed a positive relationship between educational level and migration. This means as rural youth become more educated they become more aware of employment opportunity elsewhere and hence they migrate.

Also, household farm size had a negative correlation with youth migration. This means the youth whose families have larger farm sizes are likely to migrate to explore employment opportunities elsewhere.

Moreover, land access showed a negative relationship with migration indicating that when rural youth are able to access lands for farming, they are less likely to migrate for employment opportunities.

2.5.5 Determinants of youth access to productive agricultural resources

Kidido et al. (2017) used a case study to examine access to agricultural lands by youth in the Techiman Traditional Area. Using a multistage sampling approach, they sampled 455 youth and 23 elders from 20 communities. These communities were rural and peri urban in nature.

The results show that the various modes of land access were associated with constraints such as high cost and increased competition from real estate developers in the area.

The study revealed that both market mode of land acquisition (customary license, gift or inheritance) and non-market mode of land acquisition (rental or purchase of land) were associated with major constraints. These constraints were either demand related or supply related. The demand related factors are high cost of land and competition from residential developers in the area. The supply related factors include, increased scarcity of productive family lands and the unwillingness of elders to release land to the youth.

Using a mixed method research design, it was revealed that, majority (46%) of the youth who successfully accessed land obtained it from their parents. Also, 37% of them acquired their farm lands through usufructs in the form of rentals. The remaining obtained their farm lands through other community members, elders, chiefs and queen mothers.

The youth who acquired land through the market pay amounts ranging from GHC50 to over GHC500 on an annual basis to their land owners. The amount of rent is determined by size of land, quality of land and location of land.

2.5.6 Migration motivation of rural youth

Bednaříková *et al.* (2016) investigated the factors that influence decisions of youth from Altai Krai to return to their home municipalities after university graduation.

They used a logit regression model to examine the migration intentions of 500 students from the Agrarian University in Barnaul. This was conceptualized in the framework of life quality and employment expectations with regards to agriculture.

From their results, parental support for agricultural education, family ownership of agricultural lands, ease of establishing business in the municipality and respondents' passion for agriculture decreases respondent's probability of migrating out of their parental municipality.

2.6 Youth related agricultural programmes and initiatives in Ghana

Over the past two decades, there have been an increase in youth in agriculture related programmes by governmental and non-governmental institutions. Noticeable among these are the Youth in Agriculture Programme (YIAP), Planting for food and Jobs (PFJ), Youth in Cocoa Farming (YCF), Cocoa Mass Spraying Programme and the Cocoa Hand Pollinators programme.

The Youth in Agriculture Programme (YIAP) was initiated to increase food production and promote youth participation in agriculture. More specifically, the programme was

aimed at making the youth consider agriculture as a viable employment venture, enhancing the livelihood of rural youth and improving the rural economy through agribusiness development.

The Planting for Foods and Jobs (PFJ) programme was initiated in 2017 with the aim of improving access to agricultural input and output markets to motivate farmers to increase their yields whiles generating employment along the various crop value chains.

The Program, which is being implemented by the Ministry of Food and Agriculture (MOFA) in partnerships with other public and private stakeholders is operationalized by enhanced relationships between farmers and the relevant agribusinesses. This is to ensure reliable access to financial services, inputs and output markets. The Planting for Foods and Jobs (PFJ) programme aims to transform the Ghanaian economy through food security, employment opportunities and reduced poverty.

The Youth in Cocoa Farming (YCF), Cocoa Mass Spraying Programme and the Cocoa Hand Pollinators programme were implemented by the Ghana Cocoa Board (COCOBOD). These programmes are aimed at providing rural youth with employment and enhance their participation in the sector.

2.7 Agricultural Productivity: Definition, Concept and Overview

Definitions for productivity by various scholars have been largely influenced by their expertise and their field of study. Singh & Dhillion (2000) defined agricultural productivity as yield per unit input. However, several scholars have criticized such definitions of agricultural productivity. They argue that such definitions do not acknowledge other production inputs and considers land as the only contributor to productivity. They, therefore, recommend a definition of agricultural productivity that

takes into account the contribution of production inputs such as labour, farming experience, fertilizers, agrochemicals, availability of water and other biological factors.

Some scholars have considered other production inputs in their definition of agricultural productivity. Shafi (1984) defines agricultural productivity as the "ratio of index of local agricultural output to the index of total input used in farm production". This definition, therefore, describes productivity as a measure of efficiency with which inputs are utilized in production, ceteris paribus. Also, Saxon (1965) observed that productivity is a physical relationship between output and the input which gives rise to that output. This definition depicts productivity as a physical component of production. Analysis of agricultural productivity therefore highlights issues associated with the farm production structure and provides a basis for which relevant policies can be framed.

2.7.1 Land Productivity

Most studies on agricultural productivity focus on land productivity. This could be due to the fact that land is a fixed input whiles production inputs such as labour and capital are variable to a large extent. Fladby (1983) outlined the various activities that are likely to increase the productivity of a given land. Among these are the use of improved seeds, efficient fertilizer use, efficient use of agrochemicals and labour-intensive methods. Moreover, Dharmasiri (2012) updated these activities by including the adoption of multi cropping farming systems as a way of raising land productivity. Furthermore, activities of ruminants are essential in raising land productivity. He explains that, the complex digestive system of ruminants allows them to convert roughage into nutrients that are key to plant growth.

2.7.2 Labour Productivity

Determination of agricultural labour productivity has two major issues importance. According to Dharmasiri (2012), it determines the standard of living of the agricultural population and also has implications for national prosperity. Productivity of labour is often expressed as the total output per unit of labour (Shafi, 1984). This means the income of the agricultural population can be measured in terms of output per unit labour. This includes all the labour involved in agricultural production. This involves labour directly used on the farm and labour used in off-farm production of agricultural goods and services. Assessing issues of labour productivity seem relatively complex than that of land productivity. According to OECD (2001), when considering the capacities of labourers and the intensity of their efforts, the conventional labour productivity measurement does not provide a complete assessment and hence advocates for a more comprehensive measure.

Labour productivity and land productivity are related. Increases in land productivity leads to increases in labour productivity through increased crop yields and results in increase in output per person. Similarly, adoption of improved methods of production and technology increases efficiency of labour and eventually results in increases in land productivity and total output.

2.7.3 Capital Productivity

Due to the diverse nature of capital employed in agricultural production, capital productivity in agriculture is difficult to compute and interpret. Capital influences yield through expenditure on activities such as farm buildings, land development, land purchase, drainage, irrigation, animal feed, agrochemicals, farming implements and

machinery. The availability, amount, quality and price of each of these production inputs vary spatially and influences their distribution and allocation on various farms. Hence the use of a given production input does not only depend on its availability. A decision of a farmer to use a given input will be influenced by technological and socioeconomic circumstances that will allow the substitution of one input for another and the degree of divisibility.

Also, human capital in the form of farm management play a key role in determining productivity. Jamison and Lau (1982) examined the relationship between education level, wage and crop productivity. Studies by Alderman *et al*. (1996) also confirmed the positive relationship between human capital and crop productivity.

Estimates of capital productivity provide very little guidance in ensuring efficient use of capital resources. This is because statistics on agricultural capital is less informative than those on land and labour. Also, there are a lot of non-monetized capital investments, especially in less-developed countries. For instance, the terracing of slopes and the construction of irrigation ditches are examples of non-monetized investments which essential in increasing output and productivity. However, the requirements of fixed capital stock in agriculture appear to be greater with respect to output than that of the manufacturing and mining sectors, although they differ across countries.

2.8 Agricultural productivity measurement approaches and interpretation

Although the meaning of productivity is generally accepted, debates about the interpretation of productivity estimates and choice of measurement method continues to persist. The various productivity measurement approaches and the interpretation of their impacts are discussed in the subsection below.

2.8.1 Assessment of Yields

This is the most popular productivity indicator used. It assesses crop yields over time or at a given point in time. However, a number of concerns have been raised about its interpretations. These include omission of key exogenous variables, choice of appropriate sample size, data collection procedure and biases, effects of mixed cropping and intercropping effects, continuous and multiple harvesting and non-standardization of measurement units.

Crop yields are inevitably affected by external factors such as input prices and weather effects. These external factors affect crop yield in various ways. This has raised concerns about efficient ways of controlling for these factors when measuring yield. In rain fed agriculture, rainfall becomes a very important exogenous factor. In such agricultural systems, yearly variations in distribution, timing and amount of rainfall have greater effects on yield than several conventional factors.

According to Riely *et al.* (1995), a more suitable way of controlling for rainfall is to collect yield data on a control group. However, this approach is quite expensive and difficult. A simpler and less costly approach is to explicitly relate rainfall data to yield. The problem associated with this approach is that many developing countries do not have annually or seasonally disaggregated rainfall data (Adams *et al.* 1995).

2.8.2 Comparing Actual Yields with Potential Yields

This form of productivity measurement is assessed by comparing demonstration plots yields with yields from study respondents (farmers). However, neither crop harvest nor estimation by farmers suffices for estimating average yields on demonstration plots (Diskin, 1999). A more accurate approach is to use the complete harvest since it is more

statistically accurate and efficient (Casley & Kumar, 1988). According to Murphy *et al.* (1991), there is a possibility of bias since the procedure involved in estimating yields on the demonstration plots will differ from the one used to estimate yields on study farm plots. Hence, it is very important to keep these biases in mind during productivity results interpretation.

2.8.3 Values of Crop Production

According to Diskin (1999), values of crop production may be the best productivity measurement approach. It is based on the assumption that agricultural activities do not affect other income sources of the farmer. Apart from being a better indicator, this measurement approach is associated with relatively fewer difficulties since there is no need to control for mixed cropping or measure land areas planted. However, measuring crop productivity using values of crop production is associated with challenges such as identifying the correct transaction level prices for non-marketed crops, controlling for price inflation, accounting for other by-products.

2. 8.4 Total Factor Productivity in Agriculture

Fuglie *et al.* (2016) defines total factor productivity as the ratio of a measure of output to a measure of one or more inputs used in the production process. According to Jorgenson and Griliches, 1975) when this measure is expressed as a change, it represents technological growth. With TFP levels, one can compare productivity differences between individual economic units or across regions at a particular point in time. Also, when expressed as a change, it can be interpreted as a measure of technological progress of that economic unit or region. Hence, both indicators are useful.

2.8.5 Total factor productivity approaches and measurement

Klette & Griliches (1996) classified total factor productivity measurement approaches into two main groups. These are parametric approach and non-parametric approach. The parametric approach requires econometric modelling of production functions and usually employs regression analysis in estimating the relationships between production input and output variables. Once the output can be attributed to the production inputs, the residual output can be used as a measure of total factor productivity.

Growth accounting and directional distance functions are examples of the non-parametric approach of estimating total factor productivity. In growth accounting, input and output prices are used to aggregate quantities to compute an index. This is the basis for constructing Törnqvist and Fisher Indices (Diewert 1992)

In estimating directional distance functions, a linear programming solution is used to trace out a productivity frontier using only quantity-based data. The distance of an economic entity to the frontier and shifts in the frontier over time defines a productivity index (Coelli *et al*, 2005). This is the basis for constructing the Malmquist index.

The Malmquist Index

The Malmquist index uses a non-parametric approach to assess productivity. It is defined using distance functions. These functions can be used to describe production technologies without necessarily specifying optimisation constraints. It can be used to measure both TFP levels and change. The Malmquist index for total factor productivity change between two periods is given by;

$$m_{\circ}(a_s, b_s, a_t, b_t) = [\frac{d^s_{\circ}(a_t, b_t)}{d^s_{\circ}(a_s, b_s)} \times \frac{d^t_{\circ}(a_t, b_t)}{d^t_{\circ}(a_s, b_s)}]^{\frac{1}{2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.1)$$

The Laspeyres Index

The Laspeyres index is a composite index number of price constructed by the weighted sum method. It represents the ratio of the sum of prices of a given commodity in a given period to the sum of prices in a reference period. The sums of these prices are weighted by the respective quantities of the reference period. The Laspeyres index therefore measures the relative price change of the goods whiles the quantities under consideration remain unchanged. The Laspeyres index is defined as;

$$Q_{st}^{P} = \frac{\sum_{i=0}^{N} p_{is} q_{it}}{\sum_{i=0}^{N} p_{is} q_{is}} \quad \text{..... (2.2)}$$

The Paasche Index

The Paasche Index is a weighted harmonic average of the price relatives. It uses expenditure shares in later periods as weights. The harmonic mean is the mean of a set of numbers expressed as the reciprocal of the arithmetic mean. The Paasche index is defined as follows;

$$Q_{st}^{P} = \frac{\sum_{i=0}^{N} p_{it} q_{it}}{\sum_{i=0}^{N} p_{it} q_{is}} \quad \text{..... (2.3)}$$

The Fisher Index

The Fisher index is the geometric mean of the Laspeyres and Paasche index numbers. The Fisher index provides a second order approximation to the translog production function if we assume constant returns to scale. The Fisher index is expressed as;

$$Q_{st}^{F} = \sqrt{Q_{st}^{L} \times Q_{st}^{P}} \quad \text{..... (2.4)}$$

The ratio of the output index to the corresponding input index yields the Total Factor Productivity (TFP) index. According to Fuglie *et al.* (2016), the Törnqvist index is probably the most popular method for measuring total factor productivity due to its strong theoretical properties and empirical robustness. It has been referred to as the "gold standard" approach for measuring total factor productivity.

The Törnqvist TFP index

The Törnqvist TFP index is referred to as the "The gold standard for productivity measurement". The second order flexible functional form of Törnqvist makes it superlative. The functional approach to the Törnqvist index construction uses various alternative representations of the production technology. This includes the cost, revenue, profit and input and output distance functions.

The Törnqvist index uses logarithms to compare productivity of various entities at a particular point in time or for comparing the productivity of a given entity over a given period of time (Törnqvist, 1936). When it is used to compare inputs for two-time periods, it employs an average of cost-share weights for the two periods. The index number is computed after first determining a logarithmic change as follows;

$$\ln X_t - \ln X_{t-1} = \sum [S_i (\ln X_t - \ln X_{t-1})] \text{..... (2.5)}$$

Where; $\mathbf{X_i}$ denotes production inputs, **n** denotes inputs are being considered, the two-time periods are **t** and **t-1**, and cost share weights, **Si** are computed as:

$$S_i = \frac{1}{2}\left[\left\{\frac{C_{it}X_{it}}{\sum_i C_{it}X_{it}}\right\} + \left\{\frac{C_{it-1}X_{it-1}}{\sum_i C_{it-1}X_{it-1}}\right\}\right] \text{..... .. (2.6)}$$

Where c_i denotes the unit cost of the production input. The exponential of this logarithmic change results in an index.

The theory of index numbers shows that the Törnqvist total factor productivity index possess some desirable properties. Diewert (1976) proved that the Törnqvist index follows the exact structure of the translog production function. It can be used to combine indices of various production inputs. It can also be used to combine disaggregated production inputs.

2.9 Empirical Studies on Productivity in Agriculture

This sub-section presents reviews of some current studies conducted on productivity in agriculture. They include works on productivity and technical efficiency, farm level productivity and efficiency, productivity and resource use efficiency, land productivity assessment and agricultural growth.

2.9.1 Cocoa Productivity in the Eastern Region of Ghana

Onumah et *al,* (2013) analysed productivity of cocoa farmers in the Eastern region of Ghana using a stochastic frontier analysis model (SFA). Cross-sectional data was obtained from 190 randomly sampled cocoa farmers. The stochastic frontier model employed used the partial elasticities computed from a translog production function to measure the productivity levels of the various farmers. The elasticities were computed with respect to the individual inputs used by the farmers. The productivity estimates were explained in terms of output elasticities. The production variables considered were output, land size, labour, age of trees, agrochemicals and intermediate inputs. Apart from

the average age of the cocoa tree, the farmers' output responded positively to all the production inputs.

According to their results, a percentage increase in land size, labour, intermediate inputs and agrochemical use resulted in a 0.77%, 0.08%, 0.05% and 0.15% increase in cocoa output, respectively. However, a percentage increase in the age of the cocoa trees led to a 0.13% decrease in output. Overall, a percentage increase in all inputs used resulted in a 0.93% increase in cocoa productivity.

Finally, they concluded that the cocoa farmers were unproductive and inefficient since their return to scale was 0.93 and their mean technical efficiency score was 85%.

2.9.2 Productivity of Wool Farms

Fraser and Hone (2001) explored the concept of farm level productivity for benchmarking studies using panel data from 40 wool farms from the South Western Victorian Monitor Farm Project (SWVMFP) over a period of eight years (1990-1998). They used Data Envelopment Analysis (DEA) and Malmquist estimates of Total Factor Productivity to analyse annual variations in estimates between farm level efficiency and productivity respectively. The Malmquist Index was calculated by taking the ratio of the distance of each data points relative to an efficiency frontier. Results from the Malmquist estimation suggests that the changes in productivity tend to be driven by technical progress rather than improvements in technical efficiency. The estimation results show a 2% annual contraction of the production frontier over the sample period. They explained this contraction as a constraint on production possibilities due to seasonal conditions rather than technical regress.

2.9.3 Productivity of Watermelon and Tomato Farms

Kuwornu et *al* (2012) examined the productivity of watermelon and tomato farms in the Dangme East District of Ghana using cross-sectional data from 200 randomly sampled farmers. Information on level of output per hectare and unit prices of output were obtained from the farmers through questionnaire administration.

The output per hectare and output unit price were then multiplied to obtain the value of output per hectare. Similarly, the values of the various production inputs were computed. A translog production function was used to determine the effect of the various production inputs on the total output through an Ordinary Least Square estimation. The variables used in the model were land, labour, initial capital, agrochemicals, education, distance from farm, land, number of farm plots and farmers' involvement in non-agricultural activities.

Empirical results from the study showed that land, labour and farming experience had a significant influence on the output of the tomato farmers. From the OLS estimation, a percentage increase in the number of hectares of land cultivated led to a 1.79% increase in the total value of output produced. Also, an increase in years of farming led to a 1.06% increase in the total value of output produced. Additionally, a percentage increase in the number of farming hours results in a 0.96% increase in total value of output.

For watermelon farmers, land, extension visits and farmer engagement in non-agricultural activities were variables that significantly influenced the total value of output. From the estimation results, a percentage increase in non-agricultural activities leads to a 5.81% decrease in the value of watermelon produced. Also, a percentage increase in the number of extension visits leads to a 4.52% decrease in the value of

watermelon produced. Additionally, a percentage increase in land size brings about a 0.84% decrease in the value of watermelon produced.

2.9.4 Land Productivity Assessment in Cocoa Production

Wiredu et al (2011), assessed the effect of hybrid cocoa varieties on land productivity of 366 randomly selected cocoa farmers in the Ashanti Region of Ghana using partial factor productivity (PFP) estimates. The coefficients in the productivity model were interpreted as marginal effects of production inputs on productivity. Land productivity was expressed in terms of idiosyncratic management ability and technology. The estimates from the instrumental variable regression model showed that adoption of hybrid cocoa varieties had a significantly positive influence on productivity. Additionally, land size, labour, age, nativity, and participation in secondary income generating activities significantly influenced land productivity.

2.9.5 Agricultural Growth and Productivity

In their study to compare the levels and growth of agricultural total factor productivity between Australia, Canada, and the United States for the 1961–2006 period, Sheng *et al* (2015) found that Australian agriculture has maintained is productivity relative to the United States and improved relative to Canada but maintained a productivity gap.

Using macro level data on agricultural production outputs and inputs such as land, capital, labour, rental rates and intermediate inputs they estimated output and input price indices. They further adjusted for purchasing power parity to ensure a consistent estimation of total factor productivity for the various countries.

They then used a dynamic panel regression to link the productivity estimates to its potential determinants. The results show that public research investment and infrastructural development largely account for differences in productivity levels between countries.

2.9.6 Effect of Coal Mining on Productivity

In analyzing the productivity of rice farmers in the coal mining region of Orissa in India, Mishra and Pujari (2008) employed the use of Fisher and Törnqvist indices. Using structured questionnaires, they collected primary cross-sectional data on 132 rice farms from 5 villages. Three (3) of these villages were located in coal mining areas whiles 2 were located in mom-coal mining areas. Rice production inputs such as seeds, fertilizer, farm yard manure (FYM), tractor, bullock, male labour and female labour and their respective prices were used to compute input indices. The price and quantity of rice produced was also used to compute output indices of sampled farmers. The Fisher and Tornqvist total factor productivity indices were computed for the various farmers. A number of t-tests were conducted to assess the total factor productivity differences between the mining and non-mining villages. They concluded that total factor productivity of rice farms in the non-mining region were relatively higher than that of farms in the mining region. Hence, coal mining has a detrimental effect of total factor productivity.

2.10 Cocoa Production in Ghana

Cocoa, *Theobroma cacao,* is a tropical crop which is globally consumed. Cocoa trees thrive well in temperatures ranging from 18-32°C. In Ghana, cocoa production is labour and capital intensive and is strictly market oriented. It is mainly found in the forest region of Ghana. Also, it is highly rain fed and issues of pest infestation has dominated its

cultivation for decades. In recent years, issues of sustainability and environmental protection have characterized cocoa production. This is as a result of increasing global demand for certified cocoa products. According to Benneh (1988), cocoa farms are mostly larger in size than food crop farms. The informal nature of rural land tenure systems in Ghana makes it difficult for farmers to acquire, own and continuously invest in cocoa farms.

2.10.1 Pathways for Cocoa Farm Ownership in Ghana

Hunter (1963) describes the two major patterns of collective land ownership in Ghana. They include the mosaic pattern and the strip pattern. However, individuals can acquire lands through inheritance, share-cropping, outright purchase and lease. The mode of farmland acquisition depends on when whether the individual seeking ownership belongs to the family of the custodians or not. If the individual belongs to the custodian family, ownership of the farm land is either through gift or inheritance. For individuals who do not belong to the custodian family, farm land ownership is either through a share cropping arrangements, gifts, outright purchase or lease.

Inheritance

According to Benneh (1972), families acquire lands from previous generations through inheritance. In Ghana, both matrilineal and patrilineal inheritance are practiced.

For matrilineal inheritance, if a man passes on, his properties are shared between his younger brother and the son of his elder sister. Trusteeship of family lands is passed on in the same way. Under this system, authority of family lands is entrusted to the head of the family who serves as a trustee. Here, individual members of the extended family have

the right to access and use the land. Each member takes usufruct through individual efforts. However, no one exercises ownership.

For patrilineal inheritance, if a man passes on, his properties are shared between his wife and children. Farm lands are inherited in the same way. If the deceased has more than one wives, the land is shared among the widows. The widows in turn share the land among their children.

The share cropping tenancy arrangements

In Ghana, there two major forms of share cropping arrangements (Benneh, 1988). They are the *Abunu* and *Abusa* forms of land ownership. In both systems, proceeds from the cocoa farming enterprise is shared. Also, the land owner and the tenant farmers agree on how labour and capital will be contributed towards the farming enterprise.

For the *abunu* tenancy arrangement, revenue accrued from the cocoa farm at the end of the planting season is equally shared between the landowner and the tenant farmer. Also, proceeds from sale of cover crops are also shared. However, the cost of production on the cocoa farm is borne by the landowner.

For the *abusa* tenancy arrangement, revenue accrued from the cocoa farm at the end of the cropping season is divided into three equal portions. The landowner and the tenant farmer share the revenue in the ratio of two to one respectively. The same ratio is used in contributing towards cocoa farm production cost.

Gifts

Cocoa farm lands can be acquired through gifts. An individual can acquire a cocoa farm land from a family member as a gift. Also, migrant farmers can acquire cocoa farm lands from landowners through this medium. There are no restrictions on lands acquired

through gifts. In this case, the farmer does not need to share annual farm proceeds (Hunter, 1963).

Purchase

Land for cocoa farming can be obtained through outright purchase. According to Benneh (1988), the process of cocoa farm land purchase by migrant farmers involve three basic steps. First, the migrant farmer makes a request for a farm land from the chief of the town. Upon agreement, the requested land is demarcated. Payment for the land is then made for the ownership rights to be transferred to the migrant farmer.

2.10.2 Cocoa Productivity in Ghana

In Ghana, cocoa mainly produced by small scale farmers. Cocoa production by these group of farmers is characterized by low productivity and poor agronomic practices. Also, these group of farmers are ageing and therefore unable to efficiently adopt new technologies to increase their yield. According to Binam *et al.* (2008) Ghana's cocoa productivity is the least among the top five leading producers in the world.

Waarts *et al.* (2015) estimated average cocoa productivity in Ghana to be around 331 kg/ha. However, there are some smallholder farmers with as a high as 1,420 kg/ha. This indicates a high productivity gap in the sector. Danso-Abbeam *et al*. (2015) attributes cocoa farmers productivity to factors such as age of cocoa farmers, sex, household size, membership of farmer-base-organization, educational attainment, and age of trees.

Over the past few decades, the Ghanaian cocoa has received several interventions from the Ghana Cocoa Board (COCOBOD). These include Cocoa Diseases and Pest Control Programme (CODAPEC) programme and the cocoa Hi-Technology Programme (Hi-Tech).

2.10.3 Cocoa Disease and Pest Control Program (CODAPEC)

Cocoa Disease and Pest Control Program was started in 2001 to help resolve the issue of low productivity due to infestation of pest and diseases. The programme is characterised by mass spraying of cocoa farms and the training of cocoa farmers on good agronomic practices.

By 2011, the programme had covered all 72 cocoa growing districts (Oduro & Omane-Adjepong, 2012). By the tenth year of the programme's implementation, 21 districts had been spayed against black pod disease whiles 35 districts were sprayed against Mirid/Capsid disease. Also, 16 districts were sprayed against both Black pod and Mirid.

In 2013, the programme distributed over 220,000 cartons of fungicides and insecticides to smallholder cocoa farms (COCOBOD, 2014).

2.10.4 Hi-Technology Programme (Hi-Tech)

The High Technology Programme was introduced by the Ghana Cocoa Board (COCOBOD) in 2002 to help resolve low cocoa productivity among smallholder farmers due to poor soil fertility. The programme which is dubbed "Hi-Tech" is aimed at ensuring efficient soil management practices to enhance yield. It is largely characterised by distribution of quality assured fertilizer to smallholder cocoa farmers'

According to COCOBOD (2015), the programme has distributed about 1,578,970 bags of inorganic granular, 220,000 bags of elite organic fertilizers, 60,000 cartons of lithovit and 68,345 cartons of Sidalco liquid fertilizers had been distributed in the various cocoa districts in the country.

CHAPTER THREE

METHODOLOGY

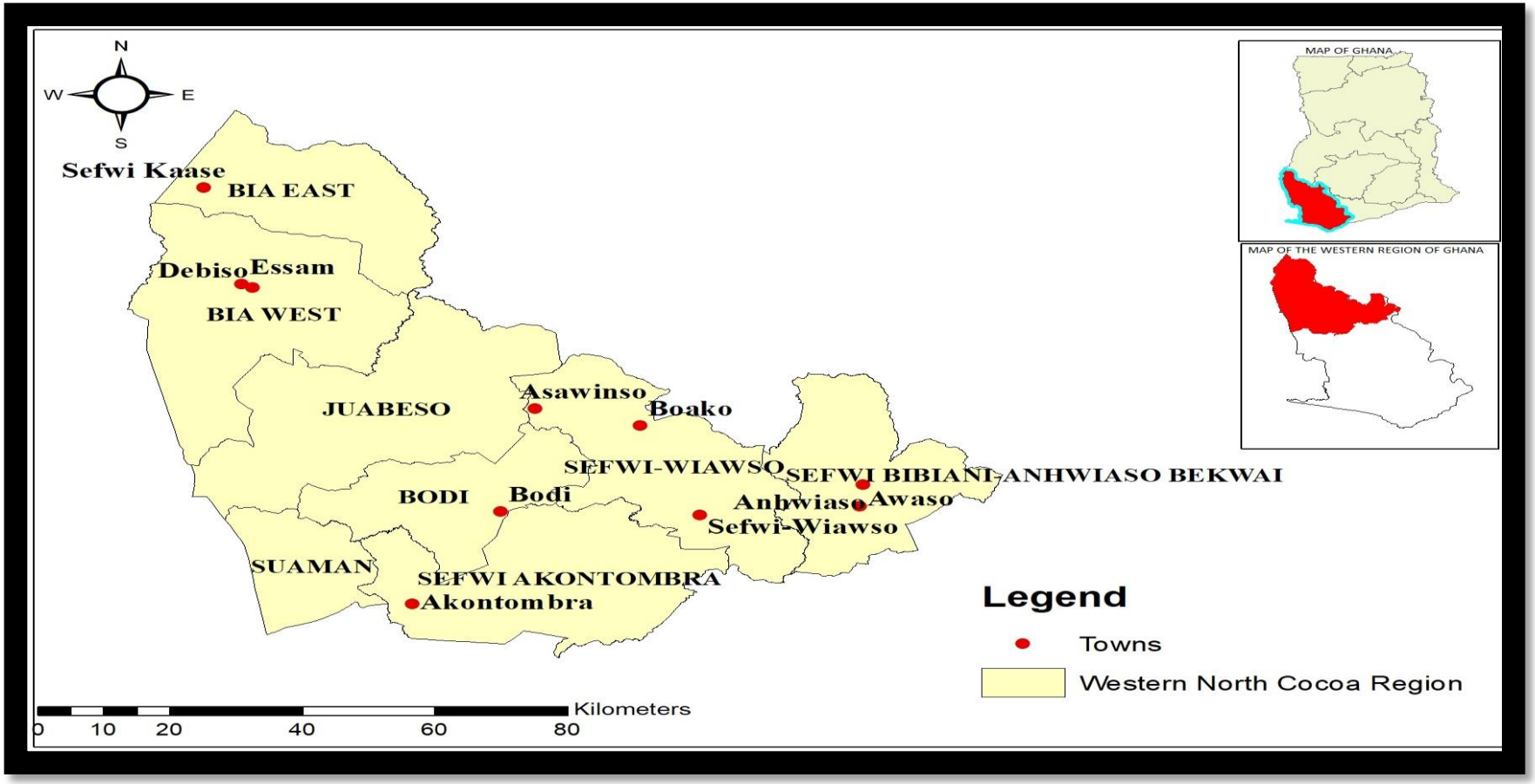
3.1 Introduction

This section presents the methodology of this study. It throws more light on the study area, conceptual framework, sampling approach and procedure and method of data analysis and theoretical framework.

3.2 Study Area

The Western North Cocoa Region has been Ghana's largest cocoa producing region over the past decade until it lost its position to the Western South Cocoa Region in the 2015/2016. The region consists of 14 cocoa districts. The Ghana Cocoa Board (COCOBOD) classifies cocoa regions and districts based on their scope of operations. The main aim of this classification is to ensure effective targeting for policy implementation and input distribution by COCOBOD. The cocoa districts in the Western North Cocoa Region are Sefwi Bekwai, Akontombra, Boako, Bodi, Juaboso, Adjuafoah, Asempaneye, Essam, Bibiani, Dadieso. The region has been the nation's highest cocoa producer over the past decade and produced about 202,261 MT in the 2015/2016 production year. Majority of the region's indigenes are either formally or informally employed in the region's cocoa value chain. For this study, the Sefwi Bekwai, Bodi, Akontombra, Boako and Asempaneye cocoa districts were purposively sampled. A map of the Western North Cocoa District is presented in Figure 3.1.

Figure 3.1 Map of the Western North Cocoa District

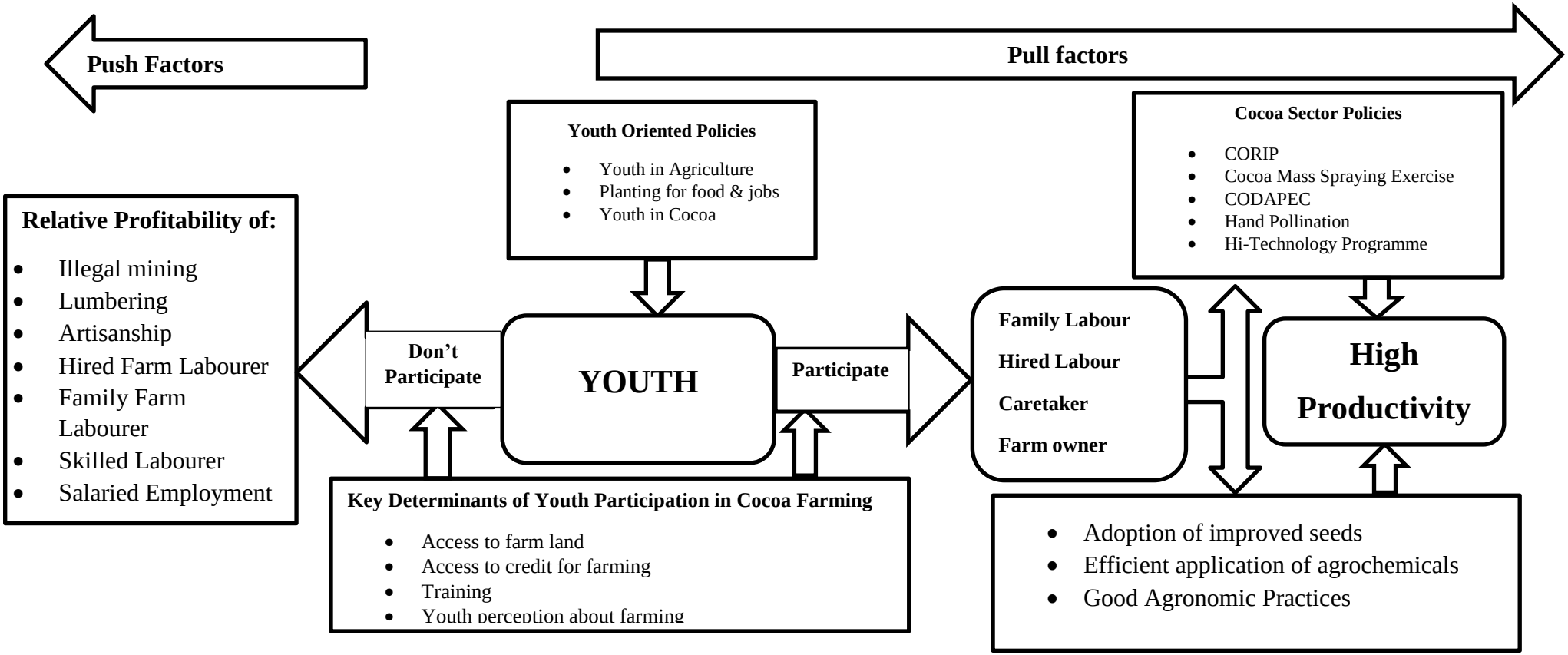


Source: CERSGIS, University of Ghana, Legon, 2018

3.3 Conceptual framework

The decision to participate in agriculture could be influenced by the desirable incentives of agricultural sector observed by an individual or the attractiveness of other competing sectors (Bezu & Holden, 2014). In the context of rural employment, the incentives can be grouped into two major categories. They are the push and the pull factors. A pictorial representation of the conceptual framework is provided in Figure 3.2.

Figure 3.2 Conceptual framework for youth participation in cocoa farming



Source: Author's Construction, 2018

The push factors refer to the various desirable characteristics of the cocoa farming in the sector. They include the production potential, risk factors, market factors, ease of land access, access to credit, and available institutional opportunities (Reardon *et al*, 2007). The pull factors are the various factors that will make cocoa farming relatively less appealing to the youth. This mainly borders on the profitability of the non-cocoa farming sector relative to cocoa farming.

Currently in Ghana, policies have been put in place for youth who intend to engage in cocoa farming and agriculture in general. These include the Youth in Agriculture Programme, Planting for Food and Jobs and the Youth in Cocoa Farming programme by COCOBOD. Also, COCOBOD have put in place policies and programmes that are aimed at increasing the productivity of cocoa farmers. The youth who take advantage of the youth related programmes are likely to become efficient technology adopting cocoa farmers. The youth can further take advantage of the already existing COCOBOD policies to help increase their productivity. The youth and productivity related policies serve as pull factors. Also, the relative profitability of other employment avenues such as petty trading, artisanship, lumbering, salaried employment and the negative perception about cocoa farming serve as push factors.

3.4 Theoretical framework

The first and second objectives of this study boarders on the concept of youth participation. Checkoway (2011) defines youth participation as the active engagement and real influence of young people in adult agencies. When young people are empowered to access productive resources such as land and credit, they will be in a

position to efficiently manage cocoa farms and subsequently increase national productivity levels.

The third and fourth objective is based on the on the production theory. In this framework, the farmer is the unit of analysis since he/she is responsible for the management of the production function. The production function represents the technology of the cocoa farm. The traditional production function is specified as follows;

$$Y = f(L, K) \qquad (3.1)$$

Where

Y = Output

L = Labour input

K = Capital input

The law of production describes the technically possible ways of increasing production levels. In the long run, output levels can be increased by altering all production inputs. However, in the short run, output may be increased by using more of variable factors ceteris paribus.

Productivity is conventionally defined as output per unit of an input used. It is either computed as a partial factor or a total factor. Shafi (1984), defines agricultural productivity as the "ratio of index of local agricultural output to the index of total input used in farm production". This definition therefore describes productivity as a measure of efficiency with which inputs are utilized in production, ceteris paribus. Total Factor Productivity (TFP) is computed to analyze productivity with respect to the various productive inputs available to the farmer. Partial Factor Productivity (PFP) is also

measured as the ratio of the quantity of a production output to that of a given production input. In this study, land productivity will represent the yield on a cocoa farm. Labour productivity includes all the labour involved in the cocoa production process. This includes labour used in pre-planting, planting, farm maintenance, harvesting and post-harvest activities.

The derivation of TFP and PFP of a given production function is expressed below.

Given a production function,

$$Y = f(x_i) \tag{3.2}$$

$$PFP = \frac{y_i}{x_i} = f(y_i, x_i) \tag{3.3}$$

$$TFP = \frac{y_i}{\sum_{n=1}^{n} X_{n,1}} \tag{3.4}$$

Where y is the output, x is the input used and k is the number of input used. ***PPF*** represents the Partial factor Productivity whiles the ***TFP*** represents the Total Factor Productivity

3.5 Sampling Approach and Procedure for Data Collection

The Solidaridad sponsored survey purposively sampled cocoa growing communities in 5 cocoa growing political administrative regions in Ghana. They include the Western, Ashanti, Brong-Ahafo, Central and Volta regions. For the purpose of this study, the sampled communities were re-categorized into cocoa regions. This categorization was based on the Ghana Cocoa Board's classification of cocoa growing communities for effective policy targeting and input distribution. This study focused on the Western North Cocoa Region. The region has produced the highest quantities of cocoa over the

past decade. Also, it has received various youth employment interventions from the Ghana Cocoa Board and development organisations such as Solidaridad. A multi-stage probability sampling approach was employed. Both probability and non-probability sampling techniques were used. The purposively selected cocoa districts were Sefwi Bekwai, Akontombra, Boako, Bodi and Asempaneye. These cocoa districts comprise 3 political districts. A systematic random sampling technique was used in sampling the respondents from the selected districts. The respondents consist of 588 youth aged between 17-35 years and 370 adult cocoa farmers that are above 35 years old. A well-structured questionnaire was administered to the respondents. The minimum sample size estimation procedure by Barlette *et al.* (2001) was employed as follows;

$$n = \frac{t^2(p)(q)}{d^2} \qquad (3.4)$$

Where *n* is the sample size to be estimated, *t* is the value for alpha level of 0.025 in each tail, *p* is the proportion of the population engaged in agricultural activities, *q* is the proportion of the population who do not engage in agricultural activities, *d* is the acceptable margin of error for the proportion being estimated (0.05). According to the 2010 population and housing census, 71.3% of the economically active population in the Sefwi Wiawso district aged 15 years and above are skilled in agriculture, forestry and fishery. For the Sefwi Akontombra district and Bodi districts, 79.0% and 84% of the economically active population are engaged in this activity respectively. Assuming a 95% confidence level and a 5% margin of error, the sample size was calculated as follows;

$$n = \frac{(1.96)^2(0.781)(0.219)}{(0.05)^2} = 263 \qquad (3.5)$$

As explained by Barlett *et al.* (2001), this procedure indicates the minimum sample size and further suggests oversampling in order to counter low response rates.

The distribution of sampled respondents from the various districts is provided in the Table 3.1

Table 3.1: Distribution of sampled respondents

Cocoa district	**Sample**
Sefwi Bekwai	270
Boako	258
Asempaneye	230
Akontombra	150
Bodi	50
Total	958

Source: Author's construction, 2018

3.6 Method of Data Analysis

This sub section presents the sampling procedure and the methodologies used in addressing the various research objectives.

3.6.1 Describing the roles played by the youth in cocoa farming

To describe the distribution in the roles played by the youth in cocoa farming in the region, descriptive statistics such as frequencies and percentages was used. Also, the youth were made to rank the cocoa farming labour services they view as profitable. These labour services include pre-planting, planting, farm management, harvesting and post-harvest services. Additionally, the youth were made to assign scores to these services. The scores range between 1 and 5 with 1 being the most profitable and 5 being

the least profitable labour service. The Kendall's coefficient of concordance was used to test the agreement and statistical significance of the rankings. The averages of these scores were further ranked from the most profitable to the least profitable labour service. The equation of the Kendall's coefficient of concordance is presented in equation 3.1

$$W = \frac{12S}{P^2\left(n^3 - n\right) - pT} \quad \text{...} \quad (3.6)$$

Where T= sum of ranks for each service

p=number of respondents

n=number of rankings

The hypothesis are:

H_0=There is no agreement among the rankings

H_1=There is agreement among the rankings

The chi-square statistics (X^2) was used to determine the significance of the Kendall's coefficient of concordance (W) at 1%, 5% or 10% significance level. The decision rule is that if the calculated chi-square is greater than the chi square critical, we reject the null hypothesis in favour of the alternate hypothesis.

3.6.2 Determinants of cocoa farm ownership by the youth

To assess the factors that influence cocoa farm ownership by youth in the Western North Cocoa Region, the probit regression model was employed. The pathways for cocoa farm ownership have been described in section 2.10.1 of this study.

The probit regression model is specified as follows;

$$\mathbf{Pr\ (Y=1|x)} = \alpha + \beta_1\ LAND_1 + \beta_2\ CRED_2 + \beta_3\ FURURE_3 + \beta_4\ WILL_4 + \beta_5\ PNFE_5 + \beta_6\ PNCF_6 + \beta_7\ SEX_7 + \beta_8\ BASIC_8 + \beta_9\ SEC_9 + \beta_{10} TER_{10} + \varepsilon \quad \text{........................} \quad (3.7)$$

Table 3.2 Description of variables for probit estimation

Variable	Description	A-priori expectation
Y	Dependent variable (Dummy; 1= Own a cocoa farm, 0= Otherwise)	
LAND	Access to land (Dummy; 1= Access, 0= Otherwise)	+
CRED	Access to credit (Dummy; 1= Access 0= Otherwise)	+
PERC	Perception of cocoa farming as a future venture (Dummy; 1= Yes, 0= No)	-
WILL	Willingness of youth to farm cocoa (Dummy; 1= Willing, 0=Not willing)	+
PNFE	Profitability of non-farm employment (Dummy; 1= Yes, 0= No)	-
PNFC	Profitability of non-cocoa farming (Dummy; 1=Yes, 0=No)	-
SEX	Sex of respondents (Dummy; 1=Male, 0=Female)	+/-
BED	Basic education (Dummy; 1=Yes, 0=No)	+/-
SEC	Secondary education (Dummy; 1=Yes, 0=No)	+/-
TER	Tertiary education (Dummy; 1=Yes, 0=No)	+/-

Source: Author's construction, 2018

3.6.3 Description of variable for probit estimation

Cocoa farm ownership

This is the dependent variable. It represents cocoa farm ownership by the youth. The sampled youth were asked whether they own a cocoa farm or not. A cocoa farm can be owned either through inheritance, share-cropping agreements, gifts or purchase. Cocoa farm ownership was modelled as a dummy variable where the youth cocoa farm owners are modelled as 1 and those who do not own farms are modelled as 0.

Access to land

Youth access to land for cocoa farming is a dichotomous variable. Kiddo *et al.,* (2017) describes access to land is a key determinant of farm ownership by youth. Youth who have access to land for cocoa farming are modelled as 1 whiles youth who do not have access to land for cocoa farming are modelled as 0. Access to land for cocoa farming is expected to have a positive relationship with coco farm ownership.

Access to credit

Youth access to credit is modelled as a dummy variable. IFAD (2014) describes access to agricultural credit as a major challenge encountered by youth who are willing to venture into agriculture. According to Dalla Valle (2012), issues such as long production cycles and vulnerability to adverse climatic patterns make it difficult for rural agriculture to be profitable. Rural youth who intend to venture in farming need credit to invest in and adopt sustainable farming practices to ensure increased yield. A youth who has access to cocoa farming credit is assigned a value of 1 whiles a youth who does not have access to cocoa farming credit are assigned a value of 0. Youth who have access to cocoa farming credit are more likely to own cocoa farms.

Perception of cocoa farming as a future employment venture

This variable describes the youth perception of cocoa farming as an employment avenue for youth. The youth who perceive cocoa farming as a future employment venture are assigned a value of 1 whiles those who think otherwise are assigned as 0. This variable was introduced into the probit regression as a dummy. A youth who perceives cocoa farming as a future venture is less likely to own a cocoa farm now.

Willingness to farm cocoa

This variable describes the willingness of the youth to farm cocoa in Ghana. According to Anyidoho *et al.* (2012), most youth in cocoa growing areas attribute drudgery and non-profitability to cocoa farming. Hence, they are unwilling to engage in cocoa faming as a major occupation. This variable was introduced into the probit regression model as a dummy. Youth who are willing to farm cocoa are assigned a value of 1 and youth who are not willing to farm are assigned a value of 0. Willingness to farm cocoa is expected to have a positive relationship with cocoa farm ownership.

Profitability of non-farm employment relative to cocoa farming

This variable describes the youth's perception about the profitability of non-farm employment relative to cocoa farming. According to Brooks *et al.* (2013), rural youth do not perceive farming as an employment that ensures a good standard of living. Hence most youth prefer to engage in off-farm employment rather than farming. This was also modelled as a dummy where youth who perceive non-farm employment as more profitable than cocoa farming are assigned a value of 1 and youth who perceive otherwise are assigned a value of 0. Perception of non-farm employment as relatively profitable to cocoa farming is expected to exhibit a negative relationship with cocoa farm ownership.

Profitability of non-cocoa farming

This describes the youth's perception about the relative profitability of non-cocoa farming to cocoa farming. According to Anyidoho *et al*., (2012) the laborious nature of cocoa farming is likely to influence a youths' decision to venture into less laborious crop farming ventures. These less laborious crop farming ventures require less labour

expenditure and hence are perceived to be profitable. The youth who see non-cocoa farming as relatively profitable to cocoa faming are assigned a value of 1 whiles those who think otherwise are assigned a value of 0. The variable enters the probit regression model as a dummy. Youth who perceive non-cocoa farming as more profitable to cocoa farming are less likely to own cocoa farms.

Sex

Sex represents the gender of the respondent. Sex was modelled as a dichotomous variable where male is assigned 1 and female is assigned 0. The likelihood of cocoa farm ownership by a male youth is expected to be greater than that of a female youth. This is because, males usually command more resources than females. Additionally, males are naturally stronger than females and this strength will be needed in the execution of labour intensive activities which characterises rural farming.

Basic education

This variable represents youth with basic education as their highest education attained. In Ghana, basic education implies a maximum of 9 years of primary formal education. A youth with 9 or less years of primary formal education is said to have basic education as his/her highest education level attained. Basic education indicates basic literacy level.

Hence, a youth with basic education should be able to understand and appreciate the profitability of cocoa farming. Youth who have their highest education as basic education are assigned a value of 1 whiles the others are assigned 0.

Secondary education

This variable represents youth with secondary education as their highest education attained. In Ghana, secondary education implies 10-12 years of formal education. A youth with 10-12 years of basic education is said to have secondary education as his/her highest educational level attained. Youth who have their highest education as secondary education are assigned a value of 1 whiles the others are assigned 0.

Tertiary education

This variable represents youth with tertiary education as their highest education attained. In Ghana, tertiary education implies 13 or more years of formal education. A youth with 13 or more years of formal education is said to have tertiary education as his/her highest educational level attained. Youth who have their highest education as tertiary education are assigned 1 whiles the others are assigned 0.

3.6.4 Determinants of Productivity

To examine the determinants of productivity, a Törnqvist Total Factor Productivity (TFP) Index was computed and used as a dependent variable in a Tobit regression model.

The expression of the Tobit model is given as follows;

$$\mathbf{TFP} = \alpha + \beta_1 CAT_1 + \beta_2 EXT_2 + \beta_3 FBO_3 + \beta_4 FO_4 + \beta_5 CREDIT_5 + \beta_6 FERT_6 + \beta_7 HYBRID_7 + \beta_8 FARM\_AGE_8 + \beta_9 FARM\_AGE^2_9 + \varepsilon \quad \text{(3.8)}$$

Table 3.3 Description of variables for the Tobit regression

Variable	Description	A-priori expectation
TFP	Total Factor Productivity Index (Dependent Variable)	
Category	Farmer category (1=Youth, 0= Adult)	+/-
Extension	Extension access (1=Yes, 0=No)	+
FBO	Membership of Farmer Based Organisation (1=Yes, 0=No)	+
FO	Farm ownership (1=Yes, 0=No)	+
Credit	Access to credit (1=Yes, 0=No)	+
Fert	Fertilizer use (1=Yes, 0=No)	+
Hybrid	Use of hybrid seeds (1=Yes, 0=No)	+
FARMage	Farm age (Years)	-
FARMage2	Farm age squared (Years)	+

Source: Author's construction, 2018

3.6.4.1 Description of variables for Tobit regression

Farmer category

This variable describes the type of farmer, whether youth or adult. Farmers aged 17-35 years old are classified as youth whiles those above 35 years old are classified as adults. Youth farmers are assigned a value of 1 and adult farmers are assigned a value of 0. Youth farmers are expected to be more productive than adult farmers.

Extension access

This describes the farmers' access to extension services in the 2016/2017 production period. According to Doss and Morris (2001), access to extension services is expected to increase productivity. Farmers who had access to extension services are assigned a value of 1 whiles those who did not access extension services are assigned 0.

FBO membership

This variable describes whether or not a farmer is associated with farmer-based organisation. According to Abebaw & Haile (2013), farmer-based organizations provide embedded support services and hence their members are expected to be more productive. Farmers who are associated with a farmer-based organisation are assigned a value of 1 whiles farmers with no farmer-based organisation membership are assigned a value of 0. Farmer-Based Organisation membership is expected to have a positive correlation with productivity.

Farm ownership

This variable represents ownership of cocoa farm land by the youth and adult farmers. Farmers who cultivate their own lands are assigned a value of 1 and those who do not cultivate their own lands are assigned a value of 0. Farm ownership is expected to have a positive relationship with productivity.

Credit

This variable represents farmers' access to cocoa farming credit for the 2016/17 production period. Farmers who had access to credit for farming are assigned a value of 1 and farmers who did not have access to credit for cocoa farming are assigned a

value of 0. This variable was introduced into the Tobit regression model as a dummy. Access to credit for cocoa farming is expected to increase productivity.

Fertilizer use

This variable represents the farmers' use of fertilizer during the 2016/2017 production period. Farmers who used fertilizer during the period are assigned a value of 1 whiles those who did not use fertilizer were assigned a value of 0. This variable entered the Tobit regression model as a dummy. Fertilizer use is expected to increase productivity.

Hybrid

This variable represents the farmers' use of hybrid cocoa seeds in cultivation. Kolavalli and Vigneri (2011) shows a positive relationship between hybrid cocoa seeds and cocoa productivity. Farmers who cultivate hybrid cocoa are assigned a value of 1 whiles those who do not are assigned a value of 0. This variable also enters the model as a dummy. The use of hybrid planting materials is expected to increase productivity.

Farm age

This describes the age of the cocoa farm. Age of the cocoa farm is measured in years. Due to the parabolic relationship between farm age and yield, the farm age variable was squared and the two variables were introduced in the model. Cocoa farms are expected to be less productive in the first eight (8) years. Between the eight and sixteenth year, productivity is expected to be high. After the sixteenth year, productivity is expected to decline.

3.6.5 Comparison of Total Factor Productivity

To compare total factor productivity differences between youth and adult farmers, Törnqvist total factor productivity index was computed using the Total Factor Productivity Index Programme (TFPIP) Version 1.0.

Furthermore, mean Törnqvist TFP indices of the two categories of farmers were computed and compared. A *t*-test was conducted to test the statistical significance between the indices.

The Tornqvist TFP index is given by;

$$(lnTFP)^{Transitive} = \left[\frac{1}{2}\sum_{i=1}^{M}(a_{it} + a_i)(lnb_{it} - lnb_i) - \frac{1}{2}\sum_{i=1}^{M}(a_{it} + a_i)(lnb_{is} - lnb_i)\right] - \left[\frac{1}{2}\sum_{i=1}^{K}(x_{jt} + x)(lny_{jt} - lny_j) - \frac{1}{2}\sum_{i=1}^{K}(x_{js} + x_j)(lny_{js} - lny_j)\right] \quad (3.9)$$

Where; $a_{js} = p_{is}q_{is} / \sum_{j=1}^{K} p_{is}q_{is}$ and $x_{js} = p_{js}q_{js} / \sum_{j=1}^{K} p_{js}q_{js}$

b_i = Cocoa Output in kg

y_i= (Land, Labour, Agrochemical)

3.6.5.1 Description of variables for Törnqvist TFP computation

Output

This represents cocoa produced in the 2017/2018 production year measured in kilograms. Cocoa output for both the minor and major season are summed to obtain the production year output. The price per kilogram is measured in Ghana Cedis.

Labour

This variable represents the total man days employed by a farmer during the production year. A man day is the amount of work done by an average man in a day. The cost per man day is measured in Ghana Cedi.

Agrochemicals

This refers the quantity of weedicide, fungicide, insecticide and liquid fertilizer used in the 2017/2018 cocoa production year. The price per litre of agrochemical used by a farmer in the production year is measured in Ghana Cedi per litre.

Land

This refers to the size of cocoa farm land cultivated in the 2017/2018 production year. The size of cocoa farm land is measured in hectares. The rental cost of land is measured in Ghana Cedis.

Table 3.4 Description of variables for Törnqvist TFP estimation

Variable	Description
OUTPUT	Quantity of output produced (kg)
LAB	Quantity of labour employed (Man-days)
LAND	Land (Hectares)
AGROCHEM	Litres of insecticides & pesticides used
P_OUTPUT	Price of output produced (GHS)
P_LAB	Price of labour employed (GHS/Man-days)
P_LAND	Annual rental cost of land (GHS)
P_AGROCHEM	Price of insecticides & pesticides used (GHS/Litre)

Source: Author's construction, 2018

3.7 Analytical framework

The Törnqvist total factor productivity framework was employed in examining the productivity differences between the sampled farmers. Törnqvist (1936) indexes are weighted geometric averages of growth rates for the microeconomic data. These indexes have been widely used by national statistical agencies and in the economics literature. It is the formula for the natural logarithm of a Törnqvist index that is usually shown. The output quantity index is given by:

$$\ell nQ_T* = \left(\frac{1}{2}\right)\sum_{m=1}^{M}\cdot\left[\left(\frac{P_m^s y_m^s}{\sum_{i=1}^{M} P_i^s y_i^s}\right)+\left(\frac{P_m^t y_m^t}{\sum_{i=1}^{M} P_j^t y_j^t}\right)\right]\ell n\left(\frac{y_m^t}{y_m^s}\right) \quad (3.10)$$

The Törnqvist input quantity index Q_T* is defined analogously, with input quantities and prices substituted for the output quantities and prices in the equation above. Reversing the role of the prices and quantities in the formula for the Törnqvist output quantity index yields the Törnqvist output price index, P_T, defined by

$$\ell nP_T = \left(\frac{1}{2}\right)\sum_{m=1}^{M}\cdot\left[\left(\frac{P_m^s y_m^s}{\sum_{i=1}^{M} P_i^s y_i^s}\right)+\left(\frac{P_m^t y_m^t}{\sum_{i=1}^{M} P_j^t y_j^t}\right)\right]\ell n\left(\frac{P_m^t}{P_m^s}\right) \quad (3.9)$$

The input price index P_T* is defined in a similar manner. The implicit Törnqvist output quantity index, denoted by Q_T, is defined implicitly by:

$$\left(\frac{R^t}{R^s} \right) / P_T \equiv Q_T \tag{3.11}$$

and the implicit Törnqvist input quantity index, Q_T *, is defined analogously using the cost ratio and P_T *. The implicit Törnqvist output price index, P_T, is given by:

$$\left(\frac{R^t}{R^s} \right) / Q_T \equiv P_T \tag{3.12}$$

and the implicit Törnqvist input price index, P_T * is defined analogously.

As indicated in Table 3.4, quantity of cocoa produced (kg), labour (man-days), land size (Ha) and agrochemical (litres) were used to compute total factor productivity.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents a discussion of the results of this study. It includes the analysis of socio-demographic variables, the distribution in the roles played by the youth in cocoa farming, assessment of factors that influence cocoa farm ownership by youth in the study area, determinants of productivity in the study area and total factor productivity comparisons for the two farmer categories (youth & adult).

4.2. Socio-demographic characteristics of respondents

The socio-demographic characteristics of the respondents are presented in Table 4.1

Table 4.1 Summary statistics of socio-demographic variables

Variable	Frequency	Percentage
Category		
Youth (≤35 years)	588	61.38
Adult (>35 years)	370	38.62
Total	**958**	**100.00**
Sex		
Males	592	61.80
Females	366	38.20
Total	**958**	**100.00**
Education		
No Formal Education	147	15.34
Basic Education	505	52.71
Secondary Education	288	30.06
Tertiary Education	18	1.88
Total	**958**	**100.00**
Mode of farm land acquisition		
Inheritance	450	78.53
Share cropping	75	13.08
Purchase/Lease	48	8.38
Total	**573**	**100.00**

Source: Field Data, 2018

From Table 4.1, 61.38% of the sampled respondents 35 years old or younger whiles the remaining 38.62% were above 35 years old. Additionally, about 60% of the respondents were males whiles the females represent about 40% of the total sample. Also, it is observed that 85% of the sampled respondents have attained at least basic education and about 15% have no formal education. Majority (78.53%) of the respondents who farm cocoa acquired their farm lands through inheritance (or from family members) whiles the remaining acquired theirs either through share cropping arrangements (13.08%) or purchase (8.38%).

4.3 Roles played by the youth in cocoa farming

The various roles played by the youth in cocoa farming were identified and grouped. As used by Martin (2012), the various roles were categorized under 4 major groups. This includes family labourers, hired labourers, caretakers and farm owners. The distribution in the roles played by youth in the Western North Cocoa Region is presented in Table 4.2.

Table 4.2 Distribution in the roles played by youth in cocoa farming

Role	Frequency	Percentage
Family labour	288	48.98
Hired farm labour	46	7.82
Farm caretakers	51	8.67
Farm owners	203	34.52
Total	588	100.00

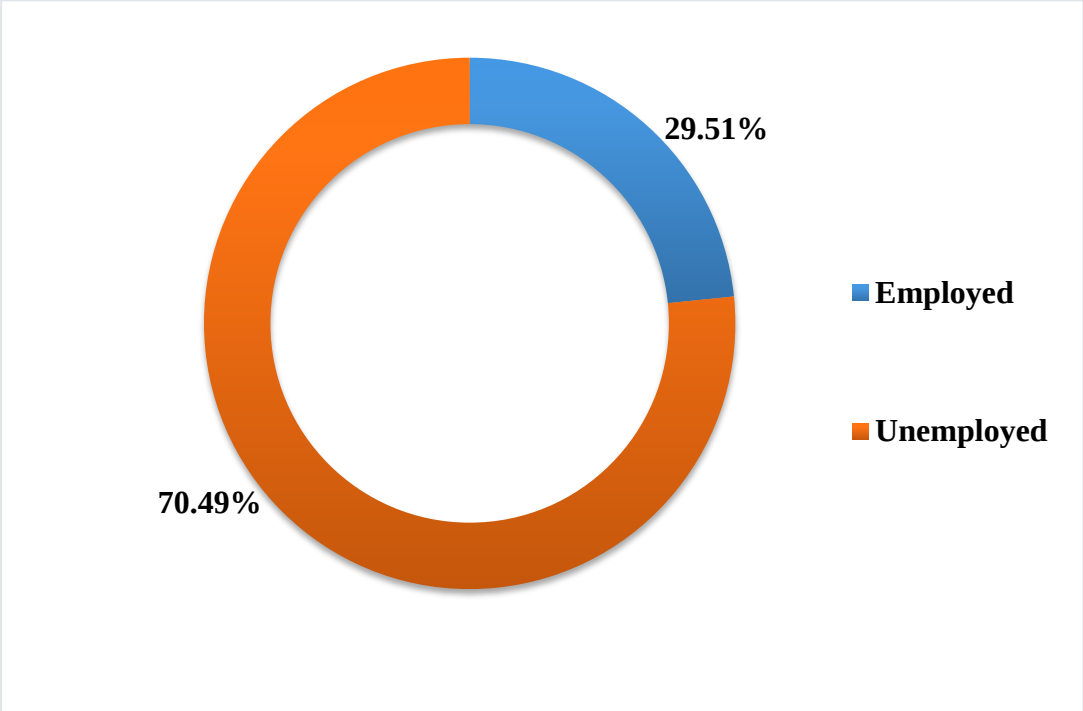
Source: Field Data, 2018

Family labour

This group of youth work on cocoa farms of their parents or other family members and relatives for no direct monetary benefit. Almost half (48.98%) of the sampled youth were engaged as family labourers in the region. Although about 71% of the family labourers are unemployed, most (61.8%) of them are unwilling to undertake cocoa farming in the future. This can be attributed to the relative lucrativeness of trading to other forms of employment. As shown in Fig. 4.2, 46.62% of the youth family labourers who are employed are involved in trading.

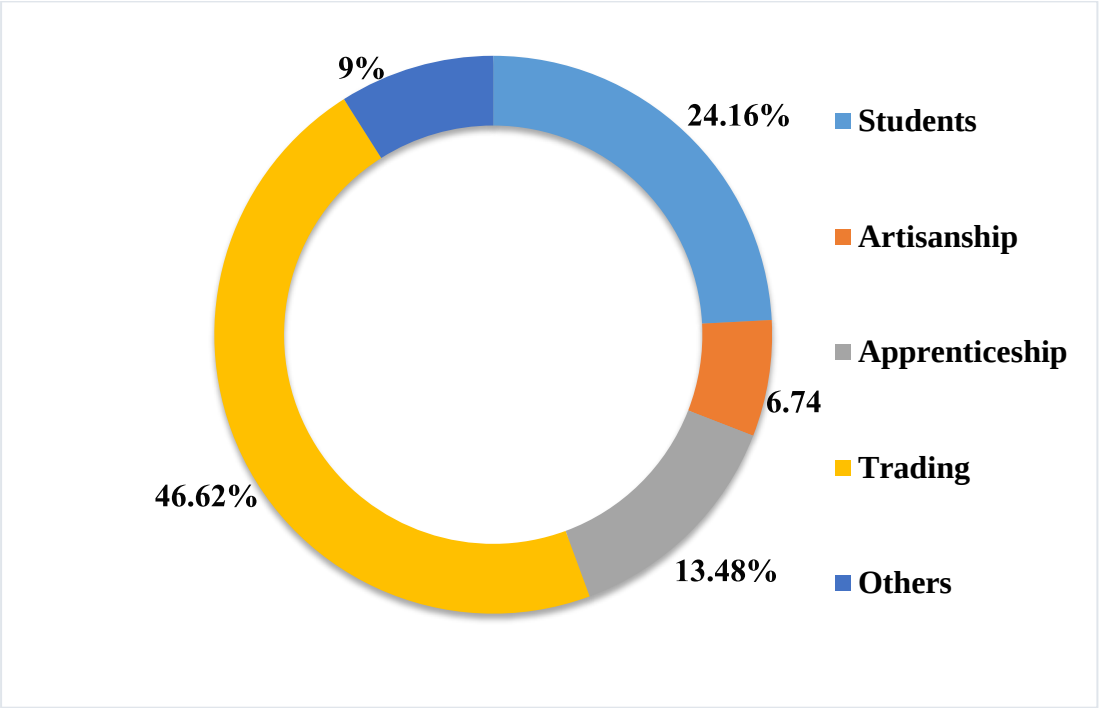
The distributions of the employment status, occupation and their willingness to farm cocoa in the future is presented in Figures 4.1, 4.2 and 4.3.

Figure 4.1: Employment status of family labourers



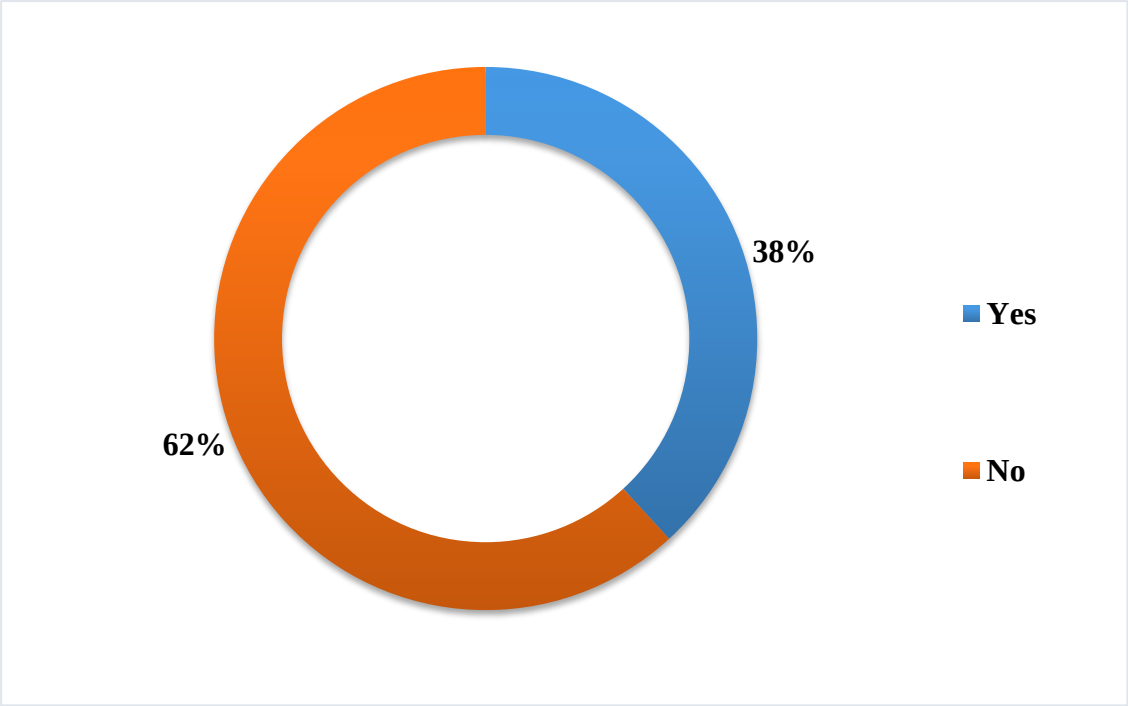
Source: Field Data, 2018

Figure 4.2: Occupation of employed family labourers



Source: Field Data, 2018

Figure 4.3: Willingness of family labourers to farm cocoa in the future



Source: Field Data, 2018

Hired farm labour

This group of youth farm workers sell their labour services to the cocoa farmers for monetary returns. From the results, 7.82% of the youth are engaged as hired labourers on cocoa farms in the region. These youth are mostly engaged by cocoa farmers for their pre-planting, planting, farm maintenance, harvesting, post harvesting services. From the results, youth who are engaged as hired labourers in the region earn between GHC 240 and GHC 3,750 annually for hiring their labour services to cocoa farmers in the region. Averagely, youth farm labourers earn GHC 1,172 annually. A breakdown of various activities undertaken by youth hired labourers is provided in Table 4.3.

Table 4.3 Services provided by hired farm labourers

Pre-planting	Planting	Farm Maintenance	Harvesting	Post-harvest activities
Land clearing	Holing and planting of suckers	Weeding, Pruning and thinning	Plucking of pods	Fermentation of beans
Felling of trees	Preparation of seedlings	Agrochemical application	Gathering and Heaping pods	Carting fermented beans
Burning	Carrying of seedlings	Fetching water for spraying	Breaking pods	Drying beans
Stumping	Planting for seedlings	Sanitation and Pruning		Carting of beans for sale
Pegs cutting				
Lining and pegging				

Source: Field Data, 2018

Also, the youth hired labourers were made to rank the five major labour services from the most profitable to the least profitable. The mean rank scores for the various services were obtained. According to estimates from the Kendall W test, harvesting services

were the most profitable whiles post harvesting activities were the least profitable. These ranks are presented in Table 4.4.

Table 4.4 Ranking of profitable labour services by hired farm labourers

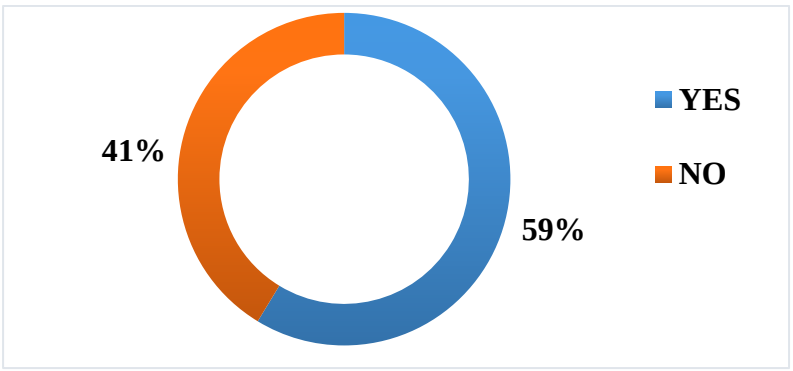
Labour Service	Mean Rank	Rank
Harvesting services	1.93	1
Farm maintenance	1.98	2
Planting services	3.41	3
Pre-planting services	3.83	4
Post harvesting services	3.85	5

N = 46
Kendall's W[a] = 0.375
Chi-Square = 69.009
df = 4
Asymptotic Sig. = 0.00

Source: Field Data, 2018

Furthermore, the hired labourers were asked whether they were willing to own cocoa farms in the future. As shown in Figure 4.4, 59% were willing to own cocoa farms in the future. This was relatively higher than that of the family labourers (38%). This could be linked to the fact that hired labourers directly earn money from providing labour services to cocoa farmers and hence are more privy to the prospects of cocoa farming than those who are just used as family labourers.

Figure 4.4 Willingness of hired labourers to own cocoa farm in the future



Source: Field Data, 2018

Farm caretakers

This group of youth are paid by farm owners to manage cocoa farms on their behalf. Farm caretakers mostly provide farm maintenance, harvest and post-harvest services. They are paid on monthly or seasonal basis. Annual incomes from cocoa farm caretaking activities range between GHC 300 and GHC4758. On the average, youth who serve as cocoa farm caretakers earn about GHC1, 511 annually.

The youth cocoa farm caretakers ranked farm maintenance services as the most profitable cocoa farm activity in the region whiles post-harvest services were ranked the least profitable. Estimates from the Kendall's W test that ranks the profitable cocoa farm related activities according to the youth cocoa farm caretakers are presented in Table 4.5.

Table 4.5 Ranking of profitable labour service by the youth cocoa farm caretakers

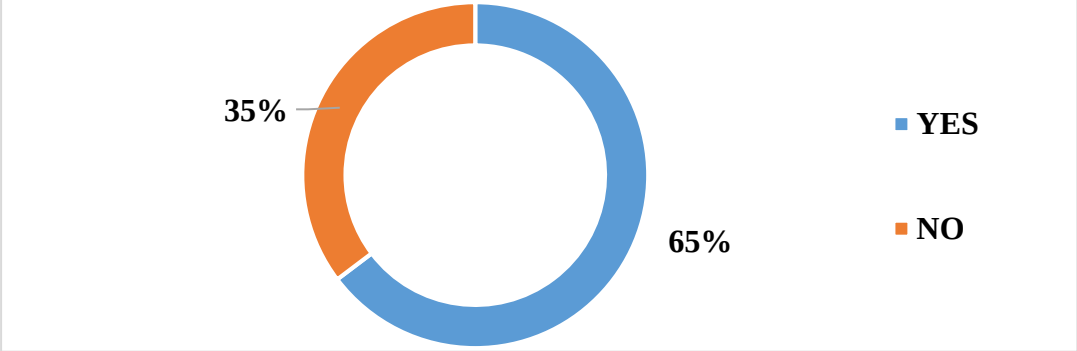
Labour Service	Mean Rank	Rank
Farm maintenance	1.82	1
Harvesting services	2.22	2
Post harvesting services	3.49	3
Planting services	3.59	4
Pre-planting services	3.88	5
N = 51		
Kendall's W[a] = 0.336		
Chi-Square = 68.627		
df = 4		
Asymptotic Sig. = 0.00		

Source: Field Data, 2018

Moreover, when asked whether they were willing to own cocoa farms in the future, 65% of responded in the affirmative. This shows that caretakers are more willing to own cocoa farms than family labourers (38%) and hired labourers (59%). This could be attributed to the fact that caretakers earn more from cocoa farming activities than family labourers and hired labourers. Aside the income cocoa farm caretakers earn for

their farm management service, they have the opportunity to intercrop the cocoa with other food crops to diversify their income sources. The willingness of caretakers to own cocoa farms in the future is presented in Figure 4.5

Figure 4.5 Willingness of caretakers to own cocoa farms in the future



Source: Field Data, 2018

Farm owners

This is the fourth category of the roles played by the youth in cocoa farming in the region. This group of youth own and/or manage their own cocoa farms. They make ultimate decisions with regards to farm management which eventually affects productivity. Ownership of cocoa farms by the sampled youth is either through inheritance, sharecropping arrangements or purchase. The distribution in the mode of cocoa farm ownership is presented in Table 4.6.

Table 4.6 Mode of farm ownership by youth cocoa farmers

Mode of ownership	Frequency	Percentage
Inheritance	159	78.33
Share cropping	29	14.28
Purchase/Lease	15	7.39
Total	203	100.00

Source: Field Data, 2018

Since the main mode for youth land ownership is through inheritance, the youth in such communities have to wait for decades to inherit land to use for agricultural activities (IFAD, 2014). Furthermore, the increase in life expectancy across the world has further increased the waiting period for land inheritance. This long waiting period is likely to influence the youth's dislike for farming (White, 2012).

4.4 Determinants of farm ownership by youth in the Western North Cocoa Region

A probit regression model was used to estimate the determinants of cocoa farm ownership by youth in the region. Cocoa farm ownership, the dependent variable was modelled as a dummy where 1 represents ownership and 0 represents otherwise. A Variance Inflation Factor (VIF) test was carried out confirm the absence of multicollinearity in the model (see Appendix 4.4).

The explanatory variables are access to land, access to credit, perception of cocoa farming as a future venture, willingness of youth to farm cocoa, relative profitability of non-farm employment to cocoa farming, relative profitability of non-cocoa farming to cocoa farming, sex and education.

From the results, access to land, access to credit, perception of cocoa farming as a future venture, willingness of youth to farm cocoa, relative profitability of non-farm employment to cocoa farming and secondary education were statistically significant at 1%. Basic education was statistically significant at 5%. Also, at a 10% significant level, sex and the relative profitability of non-cocoa farming to cocoa farming were statistically significant. Estimates from the probit regression are presented in Table 4.7.

Table 4.7 Probit regression for determinants of farm ownership by youth

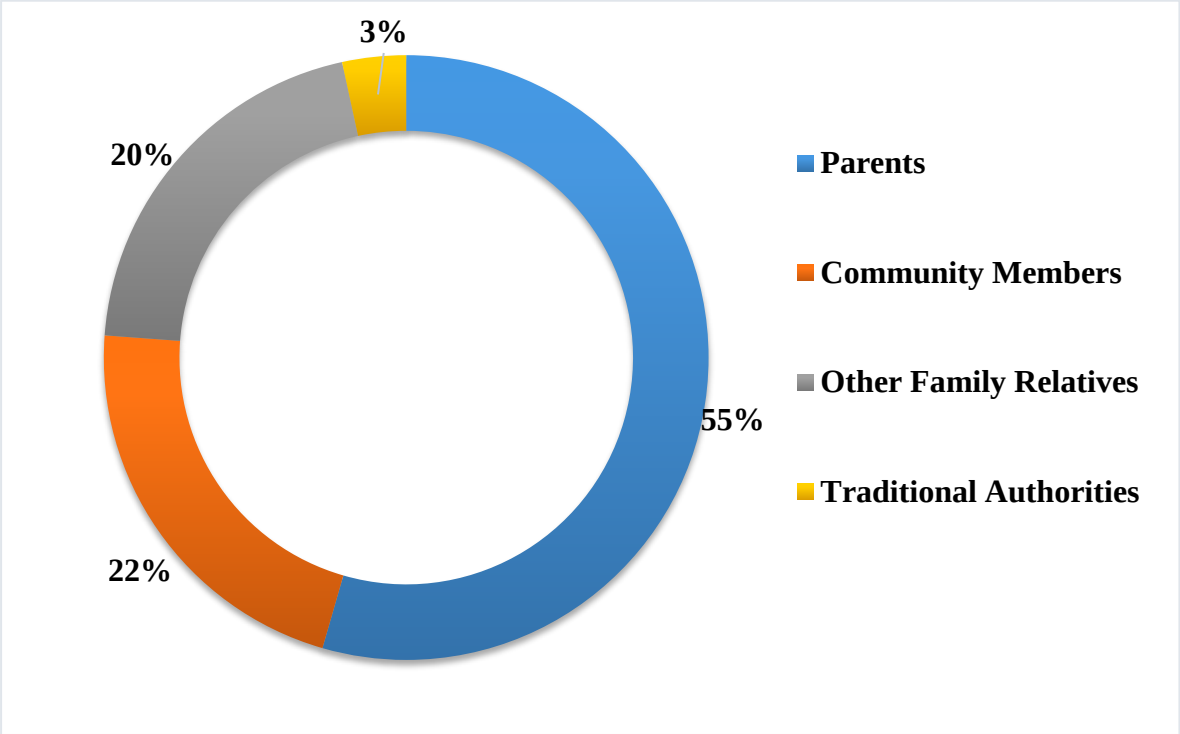
Variable	Marginal Effects	Standard Error	p value
Access to land	0.13 ***	0.16	0.00
Access to credit	0.29 ***	0.19	0.00
Cocoa as a future venture	-0.66 ***	0.18	0.00
Willingness of youth to farm cocoa	0.13 ***	0.16	0.00
Profitability of non-farm employment	-0.65 ***	0.22	0.00
Profitability of non-cocoa farming	-0.09 *	0.19	0.07
Sex	0.08 *	0.16	0.07
Basic education	-0.26 **	0.33	0.02
Secondary education	0.18 ***	0.16	0.00
Tertiary education	0.09	048	0.55
Constant	**1.85**	**0.38**	**0.00**
N=588			
LR chi2(2) =370.73			
Prob>chi2 =0.000			
Pseudo R2 =0.4892			
Log Likelihood =-193.569	**Mean VIF=1.20**		

Source: Field Data, 2018

Access to land

At a 1% significant level, access to land had a positive relationship with cocoa farm ownership. From the probit estimation, youth who have access to land are more likely to own cocoa farms than youth who do not have access. This falls in line with findings of White (2012) which states that young people are constrained in accessing land for agricultural purposes. Out of the 558 sampled youth, 209 (35.54%) had access to land for cocoa farming whiles 379(64.46%) did not. The reason for low access to land could be due to the difficulty the youth face in accessing land in the region. Of the 235 youth who made efforts to acquire lands for cocoa farming in their various communities either through their parents, community folks, other family relatives, traditional authorities and others, only 209 youth successfully acquired the land. The distribution of the means through which the youth accessed land for cocoa farming is presented in Figure 4.5.

Figure 4.6 Means of farm land acquisition by youth cocoa farmers



Source: Field Data, 2018

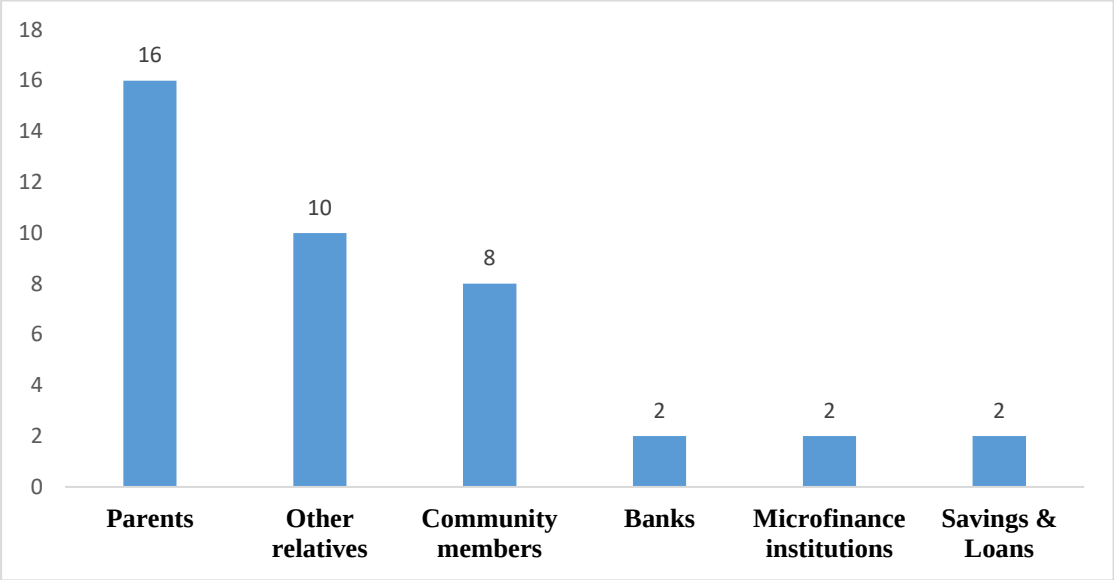
According to IFAD (2014), access to land for farming is a major challenge for youth who seek employment in agriculture. Apart from being a very important farm production input, farm lands also serve as collaterals for accessing credit, marks the youth's identity, upgrades the youths' social status and enhances youth involvement in community decision making (Dalla Valle, 2012). Also, IFAD (2014) attributes the difficulty in accessing land by youth to the prejudices and social attitudes towards the youth in typical agrarian communities.

Access to credit

From the results, access to credit had a positive relationship with the youths' decision to own cocoa farms, ceteris paribus. This means youth who have access to credit for cocoa farming are more likely to own farms than those who do not. This was statistically significant at 1%. Analysis of the field data showed that only 93(15%) out

of the 588 youth had access to credit for cocoa farming. Out of the 40 youth who made efforts to secure credit for cocoa farming, only 26 of them were successful. The distribution of the means of credit access is presented in Figure 4.7

Figure 4.7 Means of credit access by youth



Source: Field Data, 2018

Rural youth who want to engage in agriculture need credit to finance activities such as land preparation, seedling purchases, planting, irrigation and harvesting. The access to credit for agricultural activities continues to remain a global determinant of rural youth participation in agriculture (IFAD, 2014). Dalla Valle (2012) explains that the high risk associated with rural agriculture deter the available financial institutions from providing loans for agricultural activities. Rural agriculture is mainly characterized by long production cycles, high dependence on rainfall, vulnerability to variable weather patterns, and dependence on natural resources and seasonality. Furthermore, the operating cost of financial institutions in rural areas is generally high due to scattered rural populations. Officials of financial institutions have to travel long distances to

locate borrowers. Although the number of financial institutions is generally increasing in rural areas, youth involvement in the financial markets are limited due to the lack of youth friendly financial products (Dalla Valle, 2012). Also, according to Grifoni & Messy (2012), financial institutions classify youth as a high-risk category due to their lack of experience. This makes their access to credit for agricultural activities difficult.

Cocoa as a future venture

Ceteris paribus, the youth who view cocoa farming as a future venture are less likely to own cocoa farms than those who do not. This was inferred from the negative relationship depicted from Table 4.7. This was significant at 1%. Only 17.69% of the sampled youth viewed cocoa farming as an immediate employment avenue. The remaining 82.31% preferred other employment forms that provide short term returns relative to cocoa farming. However, they had plans of pursuing cocoa farming in the future. According to Anyidoho *et al.* (2012), many young people are aware of the opportunities associated with cocoa farming and have received some benefits from the sector due to the involvement of their families in the sector. Hence, they are likely to consider cocoa farming as a secondary employment avenue in the future.

Willingness of youth to farm cocoa

According to the probit estimates, youth who are willing to farm cocoa are more likely to own cocoa farms than those who are not, ceteris paribus. This was statistically significant at 1%. From the results obtained, 70.58% of the sampled youth indicated they are willing to farm cocoa if the needed support is provided whiles the remaining 24.92% indicated otherwise. This shows that the youth are willing to take advantage of institutional policies once they address issues of access to productive resources and is

properly structured. According to Ntshangase (2016), youth will be attracted to farming when they are introduced to value chain activities, operations and prospects. This will influence their perceptions and attitudes towards farming.

Profitability of non-farm employment

The results show that youth who view non-farm employment as more profitable than cocoa farming are less likely to own cocoa farms than those who do not, ceteris paribus. This was statistically significant at 1%. From the results, 84.69% of the sampled youth view other non-farm employment as more profitable than cocoa farming. According to them, employment avenues such as agro-processing, artisanship, catering and petty trading are more profitable.

Profitability of non-cocoa farming

Ceteris paribus, youth who view non-cocoa farming as more profitable than cocoa farming are less likely to own cocoa farms. According to the results, 16.67% of the sampled youth view non-cocoa farming as more profitable than cocoa farming. Of the 98 youth that hold this view, 45 of them view non-cocoa farming as more profitable than cocoa farming whiles 53 of them view farming of other crops such as oil palm and cashew as more profitable than cocoa farming.

Sex

According to the results, male youth are more likely to own cocoa farms than their female counterparts, ceteris paribus. This is consistent with that of Bezu & Holden (2014) which showed that male youth are more likely to own farms than female youth, ceteris paribus.

Education

From the results, ceteris paribus, youth with basic education are less likely to own cocoa farms than the youth with no formal education. Also, youth with secondary education are more likely to own cocoa farms than youth with no formal education, ceteris paribus. According to Anyidoho *et al.* (2012) young people with low levels of education view cocoa farming as a step towards an anticipated better life. Hence once these group of young people find alternative income sources, they are likely to engage in cocoa farming. Also, for the youth with some levels of education, cocoa farming is seen as a fall-back when they are unable to pursue further education. Additionally, some of these youth venture into cocoa farming to get adequate income to finance further education.

4.5 Determinants of total factor productivity

A Tobit regression model was used to examine the determinants of total factor productivity of cocoa farmers in the region. The two main farmer categories were youth cocoa farmers and adult cocoa farmers. The computed Törnqvist index was used as a dependent variable in a Tobit regression model. Farmer category was modelled as a dummy variable such that 1 represents youth farmers and 0 represents adult farmers. The other explanatory variables used were extension contact, FBO membership, farm ownership, access to cocoa farming credit, land fertility and cocoa seed variety. The Tobit regression model was statistically significant at 1%. Also, farmer category, FBO membership, the use of hybrid seeds and farm age were statistically significant. Results from the Tobit regression model is presented in Table 4.8.

Table 4.8 Tobit estimation for determinants of total factor productivity

Variable	Marginal Effects	Standard Error	p value
Farmer category	-0.057***	0.021	0.006
Extension contact	0.037	0.025	0.142
FBO membership	0.110***	0.031	0.000
Farm ownership	0.004	0.027	0.882
Access to credit	-0.001	0.019	0.416
Fertilizer use	0.013	0.019	0.487
Hybrid seeds	0.052**	0.020	0.011
Farm age	-0.009***	0.002	0.001
Farm age squared	0.0001***	0.000	0.004
/sigma	**0.218**	**0.006**	
No. of obs =573 **LR chi2(9) = 44.10** **Prob>chi2 = 0.000** **Pseudo R2 = -0.6184** **Log likelihood = 57.70967**			

Source: Field Data, 2018

Farmer category

This variable describes the type of farmer. Youth farmers were modelled as 1 and adult farmers were modelled as 0. Farmer category was statistically significant at 1% and had a negative sign. This means ceteris paribus, youth cocoa farmers' total factor productivity is 0.057 units less that of adult cocoa farmers. Hence, adult farmers are more productive than youth farmers. This could be attributed to higher cocoa farming experience of adult farmers relative to youth farmers. According to Onumah *et al* (2013) there is a positive correlation between cocoa farming experience and productivity. Cocoa farmers acquire a lot of farming knowledge and experience through experimentation. They are able to observe and predict effects of some conventional practices.

FBO membership

Ceteris paribus, farmers who are members of Farmer Based Organizations (FBOs) have 0.110 total factor productivity units more than non-members. This was statistically significant at 1%. Organized cocoa farmers are able to easily access training and extension services from development organizations, Licensed Buying Companies (LBCs) and other relevant institutions. These trainings equip the farmers with modern conservation and climate smart practices that simultaneously reduce production cost and increase yield. According to Abebaw and Haile (2013), farmer-based organizations provide embedded support services and hence their members are expected to be more productive. This was also corroborated by Addai *et al* (2014).

Hybrid seeds

The use of cocoa hybrid seeds showed a positive relationship with total factor productivity. Ceteris paribus, farmers who plant hybrid seeds experience 0.052 total factor productivity units more than those who do not. This is consistent with the explanation by Kolavalli and Vigneri (2011) that cocoa grown from hybrid seeds yield more than other cocoa seed varieties. This is significant at 1%.

Farm age

At a 1% statistical significance level, cocoa farm age exhibited a negative relationship with total factor productivity. Holding all other factors constant, an increase in cocoa farm age by 1 year reduces total factor productivity by -0.009 units.

4.6 Total Factor Productivity Comparison between Youth and Adult Farmers

As shown in Table 4.9, the computed Törnqvist total factor productivity scores for both youth and adult farmers were compared using a t-test.

Table 4.9 Mean comparison test (t-test) for Törnqvist TFP indices

Farmer Category	Mean TFP index
Youth	0.215
Adult	0.2367
Pooled	0.2291
T-stat	**1.4262**
P-value	**0.02523**

Source: Field Data, 2018

From Table 4.9, it is observed that adult farmers have relatively high mean Törnqvist TFP index than the youth farmers. The p-value of 0.02523 means that the difference between the youth farmers' mean TFP value and that of the adult farmers is statistically significant at 5%. Therefore, the null hypothesis that the mean Törnqvist total factor productivity index of the two categories of farmers are the same is rejected. Despite the popular notion that young farmers are more productive than older ones, this assertion couldn't be validated in this study. This could be attributed to the experience gathered by adult cocoa farmers over the years. Adult cocoa farmers acquire a lot of technical cocoa farming knowledge and experience through years of experimentation and observation of various farm intensification and intensification practices and technologies. This is confirmed by Onumah *et al* (2013).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of this study, provides conclusions on study findings and offers practical policy recommendations.

5.2 Summary and major findings

This study analyses youth participation and productivity in cocoa farming in the Western North Cocoa Region of Ghana. Specifically, the study identified and described the distribution in the roles played by the youth in cocoa farming in the region, assessed the determinants of cocoa farm ownership by youth in the region and compared total factor productivity between youth and adult cocoa farmers.

Using a multistage sampling approach and aided by Solidaridad West Africa, 958 respondents was sampled from 5 cocoa districts in the region. The districts are Sefwi Bekwai, Boako, Akontombra, Bodi and Asempaneye. This includes 592 males and 366 females. The sample includes 588 youth and 370 adults. A structured questionnaire was administered to respondents to obtain primary data.

Descriptive statistics such as frequencies and percentages were used to describe the roles played by the youth in cocoa farming and their willingness to own cocoa farms in the future. Kendall's coefficient of concordance was used to rank profitable farm labour services for youth farm caretakers and hired labourers. To assess the factors that influence cocoa farm ownership by the youth, a probit regression model was employed. A Tobit regression model to examine the relationship between farmer category and total factor productivity. The TFPIP software version 1.0 was used to compute Törnqvist

total factor productivity indices of the cocoa farmers. The Törnqvist total factor productivity differences between the youth and adult cocoa farmers were compared using a *t*-test.

The results show that youth in the Western North Cocoa Region are engaged in cocoa farming as either farm owners, farm caretakers, hired farm labourers and family labourers. Also, most of the youth either manage their own farms (34.52%) or are engaged as family labourers (48.98%). Moreover, about (78.33%) of the young cocoa farmers acquired their cocoa farms either through inheritance or from their family members. The remaining youth acquire their cocoa farms either through sharecropping, purchase or lease. Additionally, hired labourers view cocoa harvesting activities as the most profitable labour service whiles caretakers view farm maintenance activities as the most profitable labour service.

Furthermore, access to land, access to credit, willingness of youth to farm cocoa, relative profitability of non-farm employment to cocoa farming, relative profitability of non-cocoa farming to cocoa farming, perception of cocoa farming as a future venture, sex and education were significant determinants of cocoa farm ownership by youth in the region. Access to land, access to credit, willingness of youth to farm cocoa and secondary education positively influence cocoa farm ownership by youth in the region. Relative profitability of non-cocoa farming to cocoa farming and perception of cocoa farming as a future venture negatively influence cocoa farm ownership among youth in the region. Also, only 40% of the youth made efforts to access land for cocoa farming. Majority (88.9%) of the youth who made efforts to acquire farm lands were successful. Only 6.8% of the youth made efforts to access credit for cocoa farming. Most (65%) of the youth who made efforts to acquire credit for cocoa farming were successful. Additionally, majority (82.31%) of the youth consider cocoa farming as a business they

will like to venture into in the near future. Majority (84.69%) of the youth view non-farming employment as more profitable than cocoa farming. About 17% of the youth view non-cocoa farming as more profitable than cocoa farming.

Furthermore, adult cocoa farmers are more productive than youth cocoa farmers. Farmer category, FBO membership, the use of hybrid seeds and age of cocoa farm are significant determinants of total factor productivity of cocoa in the Western North Cocoa Region.

Finally, average total factor productivity of adult cocoa farmers is greater than that of youth cocoa farmers. Adult farmer's average total factor productivity is 0.057 units greater than that of youth farmers.

5.3 Conclusions

From the findings, the following conclusions were made;

- The youth in the study area are engaged in cocoa farming as family labourers, hired labourers, caretakers and farm owners. Hence, the youth in the region have cocoa farming skills that can be harnessed to increase the national cocoa production levels.
- Rural youth's decision to own cocoa farms is influenced by socioeconomic and institutional factors. The socioeconomic factors include their perceptions and aspirations. The institutional factors include access to land and access to credit
- Total factor productivity of cocoa in the Western North Cocoa Region is influenced by technical and institutional factors. Also, adult cocoa farmers are more productive than young cocoa farmers. Also, adult cocoa farmers are more productive than youth cocoa farmers in the study area.

5.4 Recommendations

From the conclusions drawn from the findings of the thesis, the following recommendations are proposed.

- Ghana Cocoa Board (COCOBOD) and other agriculture related NGO's should encourage youth to consider cocoa farming as sustainable employment venture.
- Unemployed rural youth should consider organized cocoa farming labour service provision as an employment avenue.
- Ghana Cocoa Board (COCOBOD) and various development organisations should liaise with community opinion leaders to facilitate access to land for cocoa farming for the youth in the region. Also, COCOBOD should partner with microfinance institutions in the region to provide collateral-free and low interest loans for registered and profiled youth who are willing to farm cocoa.
- Ghana Cocoa Board (COCOBOD) and agricultural extension agents in the various districts should train farmers on good cocoa agronomic practices to help increase their productivity. Also, (COCOBOD) should organise periodic cocoa farming training for young cocoa farmers to help them increase their total factor productivity.

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Appendix 3.1: Questionnaire

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS

COLLEGE OF BASIC AND APPLIED SCIENCES

UNIVERSITY OF GHANA, LEGON

This questionnaire is meant to address my research work titled "***Youth Participation and Productivity in cocoa farming in the Western North Cocoa Region of Ghana".*** this is in partial fulfilment of the award of Master of philosophy in Agricultural Economics at the university of Ghana, Legon. Be assured that this information is solely collected for academic purposes.

Questionnaire Number | | | | |

Name of Enumerator …… Date …….

District …… Community …….

SECTION A: PERSONAL INFORMATION (For all respondents)

Qno	Question	Hint	Answer Type	Options
1	Name of respondent			
2	Age of respondent			
3	Sex of respondent		Single Choice	1=Male 2=Female
4	Education level of respondent		Single Choice	1=No Education 2=Basic Education 3=Secondary/Technical/Vocational 4=Tertiary 5=Other (Specify)

SECTION B: YOUTH ONLY

Qno	Question	Hint	Answer Type	Options
1	How many siblings do you have?		Integer	
2	How many of them are still schooling?		Integer	
3	How many of them are working?			
4	How many of them are in non-farm employment?			
5	Are you currently engaged in any work?			1=Yes 0=No
6	If yes what type of work are you engaged in			1=Farm labor 2=Trading 3=Artisanship 4=Apprenticeship 5=Catering 6=Salaried employment 7= Self employment
7	Do you cultivate your own land?			1=Yes 0=No

8	If no, why?			1= No access to land 2= No start-up capital 3= Not profitable 4= It is labour intensive 5= I don't have the skills 6= Other
9	Have you tried accessing land in the community before?			1=Yes 0=No
10	Who did you contact for the land?			1= My parents 2= Other Relatives 3= Community members 4= Chief and elders 5= Self
11	Did you successfully acquire the land?			1=Yes 0=No
12	Have you accessed loan for cocoa farming before?			1=Yes 0=No
13	Who did you contact for the loan?			1= My parents 2= Other Relatives 3= Community members 4= Savings & Loans 5= Microfinance institutions 6= Banks

114	Was the loan granted?			1=Yes 0=No
15	Do you see cocoa farming as a lucrative venture?			1=Yes 0=No
16	Do you view cocoa farming as an occupation for adult only?			1=Yes 0=No
17	Would you like to venture into cocoa farming now?			1=Yes 0=No
18	Do you plan of venturing into cocoa farming in the near future?			1=Yes 0=No
19	Have you worked on a cocoa farm/sector before?			1=Yes 0=No
20	What role do you play in cocoa farming? (how are you engaged?)			1= Family Labour 2= Hired Farm Labour 3= Caretaker 4= Farm owner
21	What type of work did you do on the farm?			1= Pre-Planting Activities 2= Planting Activities 3= Farm Maintenance Activities 4= Harvesting Activities 5= Post Harvesting Activities

PRE-PLANTING ACTIVITIES	PLANTING ACTIVITIES	FARM MAINTENANCE ACTIVITIES	HARVESTING ACTIVITIES	POST HARVESTING ACTIVITIES
1=Clearing of land 2=Felling and chopping 3=Burning 4=Stumping 5=Pegs cutting 6=Lining and pegging	7=Holing and 8=planting of suckers	15=Weeding and thinning 16=Spraying agrochemical 20=Sanitation 21=Pruning 21=Mistletoe control	22=Plucking of pods 23=Breaking of pods	27=Fermentation of beans 29=Drying beans 30=Carting of beans for sale

22	Were you paid for the work?			1=Yes 0=No
23	If yes, how much were you paid?	GHS	Decimal and Single Choice	_____Amount 1=Per Day 2=Per Hectares 2=Per Square meters 3=Per Acres 4=Per Feet 5=Per Small ropes 6=Per Big ropes 7=Per Poles
24	How are you paid?			Daily Weekly Monthly Per each contract

25	How often do you work on the selected activity in **Q21** per week in the 2016/2017 season		Integer	
26	Have you received training on any of the selected activities **Q21** before?			1=Yes 0=No
27	Where did you receive the training from?			1=NGO 2=Government 3=Family 4=Cocoa Companies 5=Community people 6=MoFA 7=Other
28	Do you work on non-cocoa farms?			1=Yes 0=No
29	Which non-cocoa farms have you worked on			1=Vegetable farms 2= Food crop farms 2=Other tree (Cash) Crop farms 3=Cereals 4=Legumes 5=Others
30	Do you prefer working on a non-cocoa farm to a cocoa farm?			1=Yes 0=No

31	Rank from 1 to 7, the most profitable service offered to farmers.		Rank for all	1= Pre-Planting 2=Planting 3=Farm Maintenance Activities 4=Harvesting Activities 5=Post Harvest Activities 6=Others

SECTON C1: FOR FARMERS ONLY (YOUTH & ADULT)

31	How long have you been farming?		Integer	…….. (Years)
32	Do you belong to a farmer group?		Integer	1=Yes 0=No
33	Do you receive extension services?			1=Yes 0=No
34	How many times did you receive extension services in the 2016/2017 season?		Integer	……
35	Which of the following extension services were received from the extension agents in the 2016/2017 season?			1= Planting 2= Farm maintenance activities 3= Harvesting services
36	Did you access credit for in the 2016/2017 season			1=Yes 0=No
37	Did you receive the credit?			1=Yes

				0=No
38	How many farm plots do you have?		Integer	…… (Years)
39	What is the total size of your cocoa farm?		Integer and single choice	1=Hectares 2=Square meters 3=Acres 4=Feet 5=Small ropes 6=Big ropes 7=Poles
40	What was the quantity of cocoa produced in the last season (Sep 2016 - Oct 2017) from your cocoa farm	If farmer does not remember/can't tell put 999 If cocoa has not started yielding put 888	Decimals	_____Bags _____Kilos

SECTION C2: LAND HOLDINGS OF FARMERS

Total land holdings	How did you acquire this land?				How many years have you been farming on this land
	Plot	Type (CODE A)	Size	Unit	
	1				
	2				
	3				
	4				
	5				
	6				
	7				

CODE A

1= Purchased

2= Leased/Rented

3= Share Cropping

4= Family Land

5= Inheritance

6= Other

C3: INFORMATION ON FARMING INPUTS USED IN THE 2016/2017 SEASON

Input	Measurement		Plot 1	Plot 2	Plot 3	Plot 4	Total Quantity	Total Cost
	Unit	Unit cost						
Fertilizer								
Insecticide								
Fungicide								
Herbicides								

C4: FARM PRACTICES IN THE 2016/2017 SEASON (PLOT 1)

Farm Practices	Family Labour						Hired Labour					
	Male			Female								
	Quantity	Days	Wage/day	Quantity	Days	Wage/day	Quantity	Days	Wage/day	Quantity	Days	Wage/day
Fertilizer application												
Insecticide application												
Fungicide application												
Herbicide application												
Weeding												
Pruning												
Chupon removal												
Harvesting												
Pod breaking												
Fermentation												
Transportation												
Drying												

Appendix 4.1: Kendell W Test Profitable Labour Services by Hired Labour

Descriptive Statistics					
	Observation	Mean	Std. Deviation	Minimum	Maximum
Pre-planting services	46	3.83	1.288	1	5
Planting services	46	3.41	1.185	1	5
Farm management services	46	1.98	.830	1	4
Harvesting services	46	1.93	1.083	1	5
Post-harvest services	46	3.85	1.210	1	5

Ranks	
	Mean Rank
Pre-planting services	3.88
Planting services	3.59
Farm management services	1.82
Harvesting services	2.22
Post-harvest services	3.49

Test Statistics	
N	51
Kendall's W[a]	0.336
Chi-Square	68.627
Df	4
Asymp. Sig.	.000
Kendall's Coefficient of Concordance	

Appendix 4.2: Kendell W Test for Profitable Labour Services by Caretakers

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Pre-planting services	51	3.88	1.125	1	5
Planting services	51	3.59	1.329	1	5
Farm management services	51	1.82	.713	1	3
Harvesting services	51	2.22	1.119	1	5
Post-harvest services	51	3.49	1.405	1	5

Ranks	
	Mean Rank
Pre-planting services	3.88
Planting services	3.59
Farm management services	1.82
Harvesting services	2.22
Post-harvest services	3.49

Test Statistics	
N	51
Kendall's W[a]	.336
Chi-Square	68.627
Df	4
Asymp. Sig.	.000
Kendall's Coefficient of Concordance	

Appendix 4.3: Probit Regression Model

Variable	Coefficient	Marginal Effects	Standard Error	Z	P Value	95% Confidence Interval	
Access to land	0.4332319	0.1310035	1.59607	2.71	0.007	0.1204079	0.746056
Access to credit	0.8769437	0.2879054	1.934504	4.53	0.000	0.4977879	1.2561
Cocoa as a future venture	-2.180211	-0.6590198	1.845465	-11.81	0.000	-2.541916	-1.818507
Willingness of youth to farm cocoa	0.4963482	0.1268178	0.1632239	3.04	0.002	0.1764353	0.8162611
Profitability of non-farm employment	-1.902229	-0.65062	0.2189042	-8.69	0.000	-2.3331273	-1.473185
Profitability of non-cocoa farming	-0.3454828	0.881249	0.1924151	-1.80	0.073	-0.7226091	0.0316444
Sex	0.2913644	0.0769554	0.1561678	1.81	0.070	-0.229217	0.5892449
Basic education	-0.757569	-0.2608056	0.3251623	-2.33	0.020	-1.394875	-0.1202626
Secondary education	0.6182353	0.1798537	0.1624689	3.81	0.000	0.299802	0.9366685
Tertiary education	0.2913644	0.0906972	0.4826174	0.60	0.546	-0.6545483	1.237277
Constant	1.853771	-	0.3811161	4.86	0.000	1.106798	2.600745

Regression Diagnostics

Number of observations	588
LR chi2	370.73
Prob > chi2	0.0000
Pseudo R square	0.4892
Log Likelihood	48.213517

Appendix 4.4: Multicollinearity Test (Variance Inflation Factor)

Variable	**VIF**	**1/VIF**
Profitability of non-farm employment	1.60	0.626807
Access to credit	1.56	0.639314
Cocoa as a future venture	1.18	0.850865
Secondary education	1.16	0.871088
Access to Land	1.15	0.914072
Basic education	1.09	0.929595
Willingness of youth to farm cocoa	1.06	0.945964
Tertiary education	1.04	0.957744
Profitability of food crop farming	1.04	0.962432
Mean VIF	**1.20**	

Appendix 4.5: Tobit Regression Model

Variable	Coefficient	Marginal Effects	Standard Error	Z	P Value	95% confidence interval	
Farmer category	-0.0557056	-0.0557056	0.0209159	-2.66	0.008	-0.096882	-0.014623
Extension contact	0.0385741	0.0385741	0.0254233	1.52	0.130	-0.0113618	0.0885099
FBO membership	0.1105994	0.1105994	0.0311914	3.55	0.000	0.0493339	0.1718649
Farm ownership	0.0054485	0.0054485	0.026735	0.20	0.839	-0.0470637	0.579608
Access to credit	-0.0152607	-0.0152607	0.0192021	-0.79	0.427	-0.052977	0.224557
Fertilizer use	0.0134252	0.0134252	0.0190646	0.70	0.482	-0.0240212	0.508716
Hybrid seeds use	0.535251	0.0535251	0.0208159	2.57	0.010	0.012639	0.0944113
Farm age	-0.0095255	-0.0095255	0.0028788	-3.31	0.001	-0.01518	-0.0038709
Farm age squared	0.0001808	0.0001808	0.0000621	2.91	0.004	0.0000588	0.0003029
			0.0383532	7.28	0.0000	0.2037003	0.3543653
/sigma	0.2190488		0.006527			0.2062286	0.2318691

Regression Diagnostics

Number of observations	573
LR chi2(9)	44.10
Prob>chi2	0.000
Pseudo R2	-0.6184
Log likelihood	57.70967

Appendix 4.6: T-test Results for Differences in Total Factor Productivity

Category	**Observation**	**Mean**	**Standard Error**	**Standard Deviation**	***t*-test**	**p-value**	**95% Confidence Interval**	
Adult	370	0.2367649	0.02367649	0.2382111	1.1462	0.2523	0.2124128	0.261117
Youth	203	0.2152631	0.0140902	0.2007543			0.1874804	0.2430459
Pooled	573	0.2291473	0.0094291	0.2257095			0.2106274	0.2476673
Difference		0.0215018	0.0187589				-0.0153583	0.0583618

Satterthwaite's degrees of freedom = 478.359

Appendix 4.7: Plagiarism Checker Report

10380928:TEST_8.docx

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