UNIVERSITY FOR DEVELOPMENT STUDIES

IMPACT OF CONTRACT FARMING ON SMALLHOLDER MAIZE FARM PERFORMANCE AND AGRICULTURE COMERCIALISATION IN NORTHERN GHANA

ADAMS, JONGARE IMORU

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THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL AND FOOD ECONOMICS, FACULTY OF AGRICULTURE, FOOD AND CONSUMER SCIENCES, UNIVERSITY FOR DEVELOPMENT STUDIES, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF PHILOSOPHY DEGREE IN AGRICULTURAL ECONOMICS

AUGUST, 2024

DECLARATION

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

Adams, Jongare Imoru 14/02/2025

(Name of student) Signature Date

We hereby declare that the preparation and presentation of the thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

Professor Michael Ayamga 14/02/2025

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ABSTRACT

To facilitate the shift from subsistence-oriented agriculture to market-oriented agriculture in northern Ghana, it is imperative for smallholder maize farmers to actively engage in the market via innovation and sustainable farming methods such as contract farming (CF). This study (1) examined the design and operationalisation of maize CF schemes in northern Ghana; (2) analysed the factors that influence farmers' decisions to participate in CF schemes and how participation affect farm performance; (3) examined maize farmers' participation in markets and the extent to which CF influence the decision and degree of market participation, and (4) examined smallholder farmer linkages to the commercial value chains in northern Ghana and how contract farming influences these linkages.. The study focused was on maize CF. The study uses primary survey data collected from 169 maize CF farmers and 251 maize non-CF farmers across two regions in five districts in northern Ghana. Descriptive statistics and context analyses were used to analyse how CF schemes are design and operationalise in northern Ghana. The results showed that two type of contract designs (verbal and written contracts) exist in the study area and contract duration was usually one year. Contracts were formulated by firms independently of smallholder farmers, and thereafter submitted to the farmers, delineating all the terms and conditions of the contract for their acceptance. The endogenous switching regression model, which eliminates biases due to observed and unobserved heterogeneities in household characteristics, was employed to estimate the impact of CF on maize farmers' performance (yield and net farm income). The results showed that CF increases maize yield and net farm income per acre of contract farmers. Moreover, the non-CF farmers would have also benefited substantially if they had participated. To evaluate the factors influencing smallholder farmers' participation in the market, the Cragg's double hurdle model (applying the control function approach) was adopted. The results indicate that among other

factors CF positively influenced the decision to participate in the market. Conversely, on the extent of market participation was explained negatively by CF participation. The study concludes that CF plays a crucial role in transitioning smallholder maize farmers from subsistence to market-oriented agriculture in northern Ghana. For maximum benefits of CF and also to encourage inclusive agricultural commercialisation, policies should focus on enhancing transparency in contract, strengthening farmer bargaining power, and improving rural infrastructure.

DEDICATION

To the Almighty God and to my children, Areef Jongare Imoru and Eshaal Jongare Imoru

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LIST OF ACRONYMS

CAADP	Comprehensive African Agricultural Development Programme
FASDEP	Food and Agriculture Sector Development Programme
FSP	Fertiliser Subsidy Programme
PFJ	Planting for Food and Jobs
IPA	Innovations for Poverty Action
IFPRI	International Food Policy Research Institute
SARI	Savanna Agricultural Research Institute
NAFCO	Ghana's National Buffer Stock Company
GoG	Government of Ghana
GCAP	Ghana Commercial Agriculture Project
MoFA	Ministry of Food and Agriculture
USAID	United States Agency for International Development
CPESDP	Coordinated Programme of Economic and Social Development Policies
NDPC	National Development Planning Commission
SADA	Savannah Accelerated Development Authority
GSS	Ghana Statistical Service
GHS	Ghana Cedis
Km	Kilometres
Kg	Kilogramme

CHAPTER ONE

INTRODUCTION

1.1 Background

Smallholder farmers' effort towards agriculture commercialization is the main ingredient of a country's structural growth as its economy expands. The transition of smallholder farmers from subsistence to market-oriented farming, where they produce for the market, is associated with increased input consumption and increased agricultural output, both of which are beneficial to the economy as a whole (Mahofa *et al.*, 2022). This leads to improvement in farm incomes and higher living standards for smallholder farmers. When agricultural commercialisation emerges as a primary driver of structural development, smallholder farmers are confronted with distinct opportunities and constraints compared to large scale farmers (Gupta *et al.*, 2017). Commercialisation of agriculture has been found in studies to be among the best strategies for raising agricultural production (Kavuma and Kisaame, 2023).

Agriculture commercialisation has been defined as a progressive process in which smallholder farmers' change from producing primarily for their own consumption to producing for the market (Endalew *et al.*, 2020). The reason for agricultural commercialisation goes beyond food security to include raw materials for industries especially in the biofuel sectors. Agriculture commercialisation is seen as crucial to economic growth and its associated results, such as poverty alleviation. This is especially relevant in developing countries including Ghana, because the majority of poor households are into agriculture (World Bank, 2018; Endalew *et al.*, 2020). In Ghana, agriculture is predominantly a smallholder activity, with the majority of farmers cultivating small plots of land, typically less than two hectares. Smallholder farmers contribute significantly to the country's food production, supplying about 80% of Ghana's total agricultural output (MoFA,

2020). These farmers engage in mixed farming, primarily producing staple crops such as maize, rice, millet, sorghum, and root crops like cassava and yam. Also, they rear livestock and engage in poultry production as a means of diversifying their sources of income.

Despite their importance, smallholder farmers in Ghana face numerous challenges, including low productivity, inadequate access to credit, limited mechanization, post-harvest losses, and climate change effects (FAO, 2022). Limited access to inputs such as fertilizers, improved seeds, and irrigation further restricts their productivity, making them vulnerable to market fluctuations and environmental shocks. Building the capacity of farm households through market support systems including contract farming will boost output and commercialisation of smallholder farming. Efforts to support smallholder farmers in Ghana have been undertaken through various government and donor-led interventions, such as the Planting for Food and Jobs (PFJ) initiative, which seeks to increase productivity through input subsidies and extension services (MoFA, 2023). However, structural barriers such as poor rural infrastructure, market access constraints, and weak value chain linkages continue to hinder their ability to transition from subsistence to commercial farming. Commercialisation of agriculture, on the other hand, encompasses not only the sale of products but also the type of input used, product selection, and decision making based on the profit maximisation principle (Afework and Endrias, 2016). Seng (2016) noted that agricultural commercialisation can occur on two levels: on the input side, with an increase in the use of purchasing input, or on the output side, with an increase in marketed output.

In order to combat poverty and promote economic growth, the World Bank has reiterated that it supports value chain integration and free trade policies (Dzanku *et al.*, 2021; World Bank, 2019). Governments at the national level are developing value chain policies to achieve the integration of their economies into global trade, while international donors and non-governmental organisations

(NGOs) are promoting various value chain-based rural development interventions at the regional level to allow smallholders to benefit from global market integration (Cohen *et al.,* 2022). Integrating smallholders into local, regional, and global value chains is a popular tactic to increase agricultural output on smallholder farms (Hulke and Diez, 2022). The goals of this approach are to increase overall agricultural production, commercialize smallholder agriculture, connect smallholders to markets, and diversify regional economies (Ochieng *et al.,* 2016).

Smallholder commercialisation frequently results in a greater variety of items marketed at the national level and greater specialisation at the regional and household levels (Timmer, 1997; Pingali and Rosegrant, 1995). Smallholder commercialisation of agriculture has been a key component for poverty reduction and rural development (Muriithi and Matz, 2015; Carletto *et al.,* 2017; Muricho *et al.,* 2017). The commercialisation of the smallholder agriculture is also described as a cornerstone of household livelihoods and a critical route to economic progress (von Braun and Kennedy, 1994). This indicates that the supreme goal of commercializing smallholder agriculture is poverty reduction and to assure economic development via growth in income (Etuk and Ayuk, 2021). As a result, smallholder commercialisation is an indispensable pathway to development and growth for scores of low-income economies whose economic growth and development are dependent on agriculture (Etuk and Ayuk, 2021; Pingali and Rosegrant, 1995; von Braun et al., 1994). Accordingly, smallholder farmers have the greatest need to commercialise their farming in order to fulfill rising demand for agricultural goods and participate in income-mediated gains that will result (Kirsten *et al.,* 2012). Hazell *et al.* (2007) noted that the process necessitates better speed, breadth, and dedication in order to keep up with the fast-changing environment.

In the final stages of the systemic shift, agricultural commercialisation is predominantly driven by market forces in the non-farm sector, resulting in considerable changes in the structure of

agriculture. The attempt to boost smallholder agriculture commercialisation in Sub-Saharan Africa, particularly Ghana, dates back to the colonial period (Hall *et al.*, 2017). The commercialisation of farms in Ghana, according to Hall *et al.* (2017), has taken various forms, including differing size and labour regimes and institutional structures with shifting political importance at different times and places. Smallholder commercialisation is quantified at the household level as gross or net sales or as the ratio of the proportion of total output marketed to farm total output (Mahofa *et al.*, 2022; Etuk and Ayuk, 2021; Hussayn *et al.*, 2020;).

Based on 2018 data, agriculture employs about 38.3 percent of the active population (GSS, 2019) and contributes 19.7 percent to GDP of Ghana (MoFA, 2021). Since independence, the country's agriculture industry has been dominated by subsistence farming, which is heavily reliant on rainfall. According to MoFA (2021), smallholders dominate the industry and have been using traditional farming methods and tools like hoes and cutlasses as the primary farming instruments. While the debate over the future profitability of smallholder farms continues, various policies implemented by governments and international development organisations have prioritized agricultural intensification and commercialisation as an instrument for attaining economic growth and poverty alleviation (Mbegallo, 2016). As a result, there is renewed optimism for agricultural development, as modernisation and commercialisation of agriculture are widely regarded as prerequisites for achieving fast inclusive economic growth and development.

Smallholder agricultural commercialisation is recognized as the most feasible strategy of reinforcing the links between productivity, technology, and poverty alleviation (Pingali *et al.*, 2019; World Bank, 2019). Scholarly works (Mellor and Malik 2017; Papaioannou and De Haas, 2017) have demonstrated that commercial agriculture has an impact on the general rural economy by prompting higher labour expenditures on the side of commercial farmers and greater demand

for services and products from the rural non-farm sector. In order to commercialise smallholder agriculture, investments in infrastructure, improved seed, new technology, and market-oriented policies are required (Pingali and Rosegrant, 1995). Commercial agriculture is further hampered by a lack of knowledge about prices, supply, demand, and alternative opportunities (Anderson, 2003). According to Makhura *et al.* (2002), one of the primary reasons for smallholder farmers' reluctance to participate in the agricultural output market is high transaction costs. Smallholders are vulnerable to income and asset loss as a result of these difficulties. As a result, it is difficult for smallholder farmers to completely change to producing for the market (Rogers, 1995). Smallholder farmers have the expertise and abilities to commercialise their crops, but they are hampered by a lack of access to chemical fertilisers, improved seeds, and other productive inputs. This may be due to structural constraints imposed by institutions.

Smallholder commercialisation is seen as a critical means of improving food security, nutrition, and incomes when market barriers are reduced. It is said that commercialisation provides smallholder farmers with the welfare benefits of market-based trade economies, which is crucial to an all-encompassing development process (World Development Report, 2008; Arias, Hallam, Krivonos and Morrison, 2013). As a result, smallholder commercialisation of agriculture is predicted to lead to a highly specialised production system based on competitive advantage in resource use. Specialisation leads to increased production due to the scale of economies, higher learning by doing, frequent collaboration and exposure to superior concepts through trade, and enhanced incentive in the form of increased income, which can improve smallholder welfare gains (Jaleta *et al.,* 2009; Mathenge *et al.,* 2010). Thus, commercialisation of agriculture by smallholders is expected to affect a variety of aspects of household welfare, including productivity and production, food and nutritional security, and income.

In the past, the commercialisation of agriculture was seen as something that only large-scale farmers engaged in, with an emphasis on growing crops for profit. On the other hand, smallholders were not able to participate in the market because they primarily farmed for their own subsistence. Additionally, in certain communities, it was considered unacceptable to sell food crops (Katerega *et al.*, 2018; Opondo *et al.*, 2017; Wasseja *et al.*, 2016). Commercialisation of agriculture is often misperceived as capitalism, land expropriation, smallholder dispossession, and associated with increasing food insecurity, squeezing out smallholders, displacement, mechanisation, capital intensive rather than labour intensive, and modernisation (Sharp *et al.*, 2007). In other words, there is a fear that commercialisation of agriculture will essentially entail supporting change that benefits larger and more powerful farm sector participants at the expense of small farmers (Sharp *et al.*, 2007).

In order for smallholder farmers to compete in the global competitive market, a culture of entrepreneurship among rural smallholder farmers is needed to ensure that they produce for markets rather than marketing whatever they produce (Changalima and Ismail, 2022; Wale *et al.*, 2021; Raj and Hall, 2020). One suggestion is to support farmer groups in order to assist smallholders to achieve economies of scale in access to services and service delivery (Ismail, 2023). Contract farming, according to Kirsten and Sartorius (2002), can help farmers overcome these issues by providing them with new technologies, accessible markets, and guaranteed input and output prices.

Successive governments in Africa have pursued agricultural programmes and projects aimed at assisting smallholder commercialisation (Kirsten *et al.*, 2013). In Ghana for example, the Food and Agriculture Sector Development Policy (FASDEP I) was formulated in 2002, within the framework of the Accelerated Agricultural Growth and Development Strategy to promote

agricultural commercialisation. The goal was to modernise agriculture while also providing rural infrastructure. FASDEP II followed in 2008 as an enhancement to FASDEP I. The aim under FASDEP II was to increase smallholder integration and competitiveness in both national and global markets by producing the appropriate quantity and quality products on time. The Ghana Commercial Agriculture Project, which received funding from USAID and the World Bank, was also inaugurated in 2012. The purpose of this project was to strengthen public-private partnerships and smallholder linkages, as well as to improve the investment climate, in order to promote productivity and value addition in a particular value chain. Block farming, as well as the acquisition and sale of farm machinery at subsidised costs to large and medium-scale farmers, were also promoted. Planting for Food and Jobs (PFJ), a major programme under the Medium Term Agricultural Sector Investment Plan is another effort by government to modernise agriculture. The primary goal of PFJ is to create jobs, enhance productivity and production of food crops, provide raw materials for industry, and reduce imports while increasing exports. Other government programmes aimed at modernising the country's smallholder sector include the One District One Factory (1D1F) and One Village One Dam (1V1D) infrastructure programmes. Ghana's government strategy for agricultural transformation are mostly short- to medium-term actions aimed at modernising agriculture, increasing production efficiency, and achieving food security and farm profitability in the country (GoG, 2017).

Agricultural progress in most of Africa may be sustained by developing the smallholder systems (Alhassan *et al.*, 2013). Martey et al. (2017) further stated that farm commercialisation can be accomplished by appropriately resolving smallholder market orientation and productivity challenges. Smallholders must increase their output in order to migrate out of subsistence production, which is characterised by low productivity and input usage (Asante *et al.*, 2016).

Market price volatility of farm products and agricultural inputs, on the other hand, poses significant threats to the income of smallholder farm households (Asante *et al.,* 2016). Smallholder farmers are discouraged from taking such risks due to a lack of rural infrastructure, ineffective market systems, and a lack of financing (Asante *et al.,* 2016). According to Asante *et al.* (2016), they have an impact on agriculture commercialisation by influencing input and output pricing, product demand and supply circumstances, as well as the transaction costs of smallholders and other actors in the food marketing chain.

1.2 Problem statement

In recent times, there has been a notable promotion of out-grower and contract farming agreements as mechanisms to facilitate smallholders' involvement in the processes of agricultural commercialisation and agribusiness. Commercial agriculture is characterised by the expectation of enhanced production, higher revenue generation, improved livelihood security, and the creation of employment opportunities.

Ghana's agricultural sector strategy is to modernise and restructure the sector in order to generate employments and ensure the country's food security. FASDEP II placed a premium on the sustainable resource usage across board, the commercialisation of activities, with emphasis on growth induced by the market in the agricultural sector. To date, all government strategic frameworks and programmes recognise infrastructure development, agricultural extension, and agricultural research as critical areas of intervention for increasing agricultural productivity. Ghana's approach to agricultural modernisation is the promotion of commercialisation at the smallholder level, which encompasses market-oriented agricultural advancement, the use of technology, extensification, and the utilisation of improved inputs, among other strategies.

Within African nations, particularly in Ghana, the agricultural sector is predominantly comprised of smallholder farmers who encounter significant limitations in the marketplace. These limitations include unfavourable market conditions, limited access to credit, inadequate availability of modern inputs, and high transaction costs resulting from weak market integration (Arouna *et al.*, 2017 Martey *et al.*, 2017; Corsi *et al.*, 2017). Despite the high demand for staple crops, particularly maize, farmers remain hesitant to engage in unproductive production. The phenomenon of increased demand for maize production has been noted due to its widespread consumption in both urban and rural areas. As a result, having a robust institutional structure, such as contract farming, is critical to assisting smallholders. Contract farming (CF) has been welcomed as a prospective solution to address the limitations faced by farmers with limited resources. CF involves the pre-sale of agricultural produce through collaboration with a firm, in exchange for various benefits such as the provision of input funding (Olounlade *et al.*, 2020, Dubbert and Abdulai, 2022). Although CF is primarily a commercial endeavor, it can be seen as a strategy for enhancing smallholder farmers capacity to navigate the challenges they encounter when attempting to access more lucrative markets. The utilisation of CF facilitates the establishment of linkages between farmers and output markets, while also frequently offering access to inputs, credit ratings, and agricultural extension services. CF has been purported to have a positive influence on local economies through its capacity to enhance the well-being of rural households (Adabe *et al.*, 2019, Pham *et al.*, 2021, Danso-Abbeam *et al.*, 2023). CF can enable smallholders in locations where there are limited marketing prospects integrate into the exchange market or encourage them to become market-oriented farmers by assisting them in producing marketable surplus. CF success in incorporating smallholders into the commercialisation process, on the other hand, is dependent on a variety of factors. However, in order to enhance the impact of CF on farmers' farm

performance and yield, and their consequent effects of household welfare and food security, it is crucial to comprehend and acknowledge the limitations and possibilities associated with farmers' participation in CF.

CF schemes entail agreements between farmers and agribusiness firms outlining production and marketing plans. Some CF include clauses that stipulate price, quantity, and, on occasion, quality and delivery requirements in order to ensure a steady sales market. As a consequence, farmers may efficiently manage their own resources and inputs for production (Soullier and Mouster, 2018). Alternative CF arrangements, on the contrary, make available additional resources such as provisions for seedlings and fertiliser, credit facilities, and supplemental support like harvesting, transportation and extension services. According to Otsuka *et al.* (2016), farmers are required to follow specific production practices and input regimes outlined in this agreement. This CF agreement provides farmers with a solid market and reduces the risks connected with production and selling. Nonetheless, due to a slew of notable barriers and flaws, a thorough examination of the structure and implementation of CF schemes in Ghana is required. Furthermore, it is critical that CF schemes address mechanisms for risk sharing efficiently; nevertheless, there is a lack of clarity regarding the allocation of these risks among interested parties. Although CF provides a guaranteed market for agricultural produce, there are still questions about pricing transparency, justice, and farmers' ability to negotiate reasonable terms. These factors have the potential to have a significant impact on the financial profits and general well-being of smallholder farmers.

Furthermore, the legal and regulatory environment for CF in Ghana varies significantly, thereby affecting contract enforcement, farmer rights protection, and dispute settlement. Thus, despite the fact that CF as a channel of promoting the development of agriculture in Ghana has become increasingly prominent, there is a dearth of comprehensive research that thoroughly evaluates the

structure and implementation of these initiatives. It is imperative to acknowledge and address this existing research vacuum as it holds significant importance in providing insights for policy formulation and practical implementation strategies. By doing so, we can effectively optimise the advantages of CF for small-scale farmers, agribusiness enterprises, and the broader agricultural industry in Ghana.

Countless scholarly investigations (e.g., Bidzakin *et al.,* 2020; Dubbert, 2019; Tonne *et al.,* 2018; Minot and Sawyer, 2016) have demonstrated the pivotal role of CF in facilitating the shift towards contemporary agricultural practices and its substantial positive impact on the livelihoods of numerous smallholder farmers in Sub-Saharan African (SSA) countries such as Ghana. Other studies (e.g., Dubbert 2019) have demonstrated that CF offers smallholder farmers the opportunity to market their produce in the domestic as well as international markets. Additionally, CF has been found to enhance farm productivity and improve welfare indicators such as household income, food security and per capita consumption expenditure. These findings are supported by research conducted by Bezabeh *et al.* (2020), Meemken and Bellemare (2020), Ragasa *et al.* (2018), Bellemare and Novak (2017), and Bernard *et al.* (2017).

Although there are benefits associated with CF, the ongoing discourse surrounding its development remains unresolved (Bellemare and Bloem, 2018). There is evidence indicating that corporations exploit inexpensive labour and transfer the burden of production risk onto farmers, resulting in a decline in the welfare of farmers (Miyata *et al.,* 2009). In addition, it is common for buyers to acquire goods from regions that have superior road infrastructure, convenient water access, or regions that receive financial support from non-governmental organisations (NGOs) and other donors. This practice has the potential to exacerbate regional inequalities (*Barrett et al.,* 2012). Companies may exhibit a preference for collaborating with commercial farmers, a practice that

has the potential to exacerbate the existing disparity faced by small and susceptible farmers residing in rural regions (Hoang, 2021). Thus, there is inconclusive discussions in the development space, regarding CF and its effect on farmers' farm performance (measured as net farm income and yield). Moreover, CF has been developed as a major strategy aimed at facilitating agricultural commercialisation through the establishment of formalised agreements between smallholder farmers and agribusiness enterprises. The significance of agricultural commercialisation in Africa is widely acknowledged as a crucial means to improve food security, augment income prospects for rural populations, and stimulate economic development. Hence, it is evident that despite the widespread utilisation of CF in Ghana, there is a significant dearth of empirical research that thoroughly investigates its design, operationalsation, and its effects on farm productivity, as well as its role in promoting agricultural commercialisation.

1.3 Research questions

1. How is contract farming operationalized within the context of agricultural commercialisation?
    a) What are the characteristics and design attributes of existing contract farming arrangements in Northern Ghana?
2. Does CF influence smallholder maize farm performance in Northern Ghana?
    a) What factors influence contract farming participation and farm productivity in the area?
3. What are the drivers of smallholder maize farmers' market participation (decision and extent of participation) in Northern Ghana?
4. How does smallholder maize farmers in Northern Ghana link to the exchange market?

1.4 Study Objectives

1.4.1 Major Objective

The primary objective of the study is to determine the degree to which CF improve maize farm performance and commercialisation in northern Ghana.

1.4.2 Specific objectives

1. Examine how CF schemes are designed and operationalised in Northern Ghana using maize as a case study.
2. Analyse the factors that influence farmers' decisions to participate in contract farming schemes and how participation affect farm performance (maize yield per acre and net farm income.
3. Examine maize farmers' participation in markets and the extent to which contract farming influence the decision and degree of market participation.
4. To examine smallholder farmer linkages to the commercial value chains in northern Ghana and how contract farming influences these linkages.

1.5 Study Justification

Upholding subsistence agriculture involves inefficiency and impractical to guarantee long-term food access and eradicate poverty (Poulton, 2017; Pingali *et al.*, 2005; Pingali, 1997). Since subsistence farmers are usually the poorest and most vulnerable in rural parts of northern Ghana, it is crucial to integrate smallholder farmers in the trade economy in order to promote food security and reduce poverty. Ghana's agricultural policies, namely FASDEP II, emphasize the importance of farm households playing a major role in boosting the sector's competitiveness and contribution to economic growth. Additionally, in light of the ongoing food crisis, the Ghana government has realized the value of increasing national agricultural productivity and commercialising farm

households. Therefore, one crucial step in developing appropriate policies for the growth of smallholder agriculture is to spot the underlying contributing elements that influence smallholder farmers' market supply or participation. This study therefore spotted the underlying factors contributing to market participation by small-scale farmers in northern Ghana.

In order to address for insecurity, it is also necessary to encourage increased crop yield to meet the growing need of an expanding populace and urbanisation. At the same time, the agricultural industry needs to undergo structural changes as a result of diminishing farmlands brought on by population growth. The inclusion of smallholder farmers in the technological transformation process and commercialisation will make agricultural development more pro-poor (De Janvry and Sadoulet, 2009). This thesis offers two contributions to this regard. First, it adds actual data on the primary factors influencing farm households' agricultural commercialisation in northern Ghana and which commercialisation pathway (CF or non-CF pathways) to adopt to affect rural poverty and improved smallholder income. Secondly, in order to inform rural development initiatives that aim to promote smallholder commercialisation of agriculture, it is helpful to understand the marketing behaviours of smallholder farm households. This is especially true in the settings of northern Ghana, where subsistence farming and unreliable markets are common. Agricultural commercialization in Northern Ghana is peculiar with the cereal sub-sector specifically the maize sector. The maize subsector has been identified as one of the crops targeted for commercialisation in Ghana. The study identified critical policy areas that policymakers and other stakeholders should focus on in order to advance market involvement of smallholder maize producers for income growth and food security. The effective commercialisation of the maize subsector will help the country reach the Sustainable Development Goals (SDG) 1 and 2 ("end poverty in all its forms everywhere" and zero hunger respectively).

Increased agricultural commercialisation, according to Dubbert (2019), plays a significant role in agricultural growth, with both smallholders and large-scale farmers contributing to varied degrees. This study will add to the sprouting body of literature demonstrating the value of CF schemes in integrating smallholders into modern agricultural commodities markets. This study offers knowledge of the importance of CF as a commercialisation model in enhancing smallholder farmers' market involvement in northern Ghana. This will add to the pool of current but limited information and literature with a focus on the operations of maize contract farming programmes in northern Ghana, and will thus be a reference for researchers, policymakers and academics. Policymakers can also use the findings of this study to develop appropriate trade policies connected to CF, which are vital for the growth of smallholder agriculture commercialisation in northern Ghana. This study also makes inferences that will go a long way towards enhancing maize productivity and smallholder maize farmers' market participation. It will also help determine whether CF is a viable technique for increasing smallholder farmers' food crop commercialisation in Ghana, particularly in northern Ghana.

1.6 Organization of study

This thesis is organised into eight chapters. Chapter two reviewed literature on various thematic areas related to the objectives of the study. Chapter three presents the research methodology which includes the research location, the sampling techniques and the methodological techniques adopted to analysed the data. Chapter four presents and discuss the design and operationalisation of maize CF schemes in Northern Ghana (objective one). The empirical results on the drivers of contract involvement and the impact of participation on farm performance (yield and net farm income) in northern Ghana is presented in Chapter five. Chapter six presents and discusses the determinants of smallholder market involvement and the extent of participation in the market in northern Ghana.

Smallholder farmers' integration into input and output markets in northern Ghana is discussed in chapter seven (7). Following the chapter seven is the summary, conclusions and policy recommendation which are presented in Chapter eight.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This study evaluated relevant literature which are in line with the objectives of the research. This chapter gives a synopsis of extant empirical research as well as theoretical perspectives on CF and smallholder agricultural commercialisation. The goal is to identify different scholars' perspectives on CF and smallholder commercialisation. The review of the literature is organised around the following themes: overview of concepts of agriculture commercialisation, processes and impact of smallholder commercialisation, the pathways of smallholder commercialisation, measurement of agriculture commercialisation, factors influencing agriculture commercialisation and empirical studies of agriculture commercialisation (market participation). The chapter also included review of models of agricultural commercialisation, empirical studies of contract farming, factors motivating smallholders' involvement in CF, impact of CF on smallholder farm households and empirical studies on impact evaluation. Finally, the chapter also focuses on the theoretical frameworks of agricultural commercialisation, which offers the context in which the research is conducted as well as identify the gabs in the literature.

2.1 Overview of Agriculture Commercialisation

The concept of commercialisation is viewed as multi-dimensional, and there is no single definition that encompasses all aspects of commercialisation. These definitions differ in focus and scope, and have influenced the measurement of smallholder commercialisation. The degree of market involvement, particularly the output market, is a common word that runs through all definitions.

According to Leavy and Poulton (2007), agriculture commercialisation lacks clarity in its meaning, which can lead to misunderstanding and a limitation in translating policy into practice. Snoxell and Lyne (2019) noted that the general assessment tends to define agriculture commercialisation as the transformation of a subsistence agricultural system into a more intricate market-based production and consumption system. According to Pretty *et al.* (2011), agricultural commercialisation entails a change in land use from low-value commodities to those with higher market prices; a slow transition from semi-subsistence agriculture to production primarily for the market; and a growing reliance on the market for labour and other production inputs (Poulton and Chinsinga, 2018). Food crops are included in this definition because commercialising households can respond to market signals by marketing higher portions of their food crops (Jaleta *et al.*, 2009). Farmers would gradually switch from subsistence-oriented production—which tries to meet subsistence needs—to market-oriented production decisions—which are motivated by comparative advantage and market signals—as a result of commercialisation (Tabe-Ojong *et al.*, 2022; Jaleta *et al.*, 2009).

Two contrasting commercialisation dynamics are incorporated in Poulton's (2017) concept of agriculture commercialisation. The first of these happens as smallholder farmers transition to producing typically for market rather than semi-subsistence, becoming more and more dependent on labour and purchased inputs in the process. They still produce on a modest scale, though, mostly because there is a strong demand for land from those who have not yet found more stable and well-paying jobs in the non-farm sector. The second dynamic arises when large or medium-scale farm operations that are mostly or exclusively commercial in character supplement or replace smallholder farm households.

Studies such as Wineman *et al.* (2020), conceived agricultural commercialisation in terms of intensifying land and labour productivity per unit to generate more surpluses for the market, which raises income and living standards. Konja and Mabe (2023), and Mutabazi and Boniface (2021) defined commercialisation as the percentage of crop sold out of total crop output and refer to it as agriculture commercialisation. In other words, household commercialisation occurs when a household's production decision is based on comparative advantage and market signals, whereas subsistence production is based on output capability and subsistence needs, with surplus sold only after household consumption needs are filled (Boka and John, 2017).

According to the concepts stated above, smallholder commercialisation consists of two stages: the first stage involves engaging in either the output or input markets, while the second stage involves the degree of engagement in the market. In most cases, the amount of participation is evaluated by the quantity of crops generated and sent to the market for sale in comparison to overall farm production. The conclusion is that agricultural commercialisation occurs when farm households are able to generate a marketable surplus above their consumption needs.

2.2 Processes and potential impacts of smallholder farmer commercialisation

Because commercialisation of agriculture offers a competitive advantage over subsistence farming, smallholder commercialisation is sometimes perceived to have the ability to increase food security at the household level. According to Asfaw et al. (2010), economic liberalisation has given smallholders the possibility to diversify their products and generate excess that may be sold in the local market. The reduction of trade obstacles, as well as the prevention of monopolies in market system, gave small-scale farmers opportunity to select their market for produce and farm inputs

(Shiferaw *et al.*, 2008). As a result of such participation, income rises, improving the livelihoods of smallholder farm households.

According to Olwande and Mathenge (2011), commercialisation benefits poor smallholders by boosting labour productivity, which produces employment in the low-capital production system of smallholder agriculture. Gains are received directly by both hired labour and commercialising households (von Braun, 1995). However, von Braun (1995) warns that, though commercialisation in and of itself rarely has a negative effect on smallholders welfare, commercialisation in the midst of failed policies, institutions, or the market can have a negative impact on smallholder households. Though improved market access and commercialisation of smallholder farmers will result in increased production, revenue, and investment, several obstacles stand in the way of this development (Olwande and Mathenge, 2011). These challenges include output market identification and commodity type, which can help many smallholder farmers increase their returns; market and commodity identification, which can provide more opportunities for small farm households and constraints identification and intervention, which can significantly improve small farm households' access to markets. However, several studies have attempted to address similar issues. Evidence suggests that the total size of domestic markets for basic foods is significantly greater than the entire quantity of commodities exported or of high value (Hazell, 2005; Diao *et al.*, 2007). This means that the market for staple foods may accommodate more smallholder producers than other markets. The significance of linkages between different industries and the economy as a whole is emphasised by various research. Diao and Dorosh (2007) imply that some high-value crops including horticultural crops, have the potential to serve as a viable development strategy despite their currently limited production base. This potential is driven by their impact on the labor market and various multiplier effects, including stimulating investment

in input consumption and fostering technological innovation. Other studies, however, provide evidence of growing stricter health regulations on agricultural produce imports into industrialised countries, which may impede smallholders' access (Asfaw, 2007; Okello *et al.,* 2008).

According to Jayne *et al.*, (2005), smallholders participate in the market infrequently, resulting in a relatively small total market share. According to their findings, fifty percent of observed maize output that was marketed in Kenya, Mozambique, and Zambia was sold by two percent of the top commercial farmers. Furthermore, Ellis (2005) observed that in semi-arid areas of Africa, the proportion of product that was marketed was quite low. In Kenya, empirical evidence indicates a transition from staple food production to increased engagement of smallholders in tree crops, dairy and horticulture due to diminishing farm sizes (Jayne *et al.*, 2005). This phenomenon can be attributed to the low prices supplied for staple goods, while smallholders want to enhance return on investment. Commercial agriculture empowers smallholder farmers economically through increased productivity, household income, household employment, nutritional welfare, health, education, and consumption diversity (von Braun *et al.*, 1994).

2.3 Pathways of smallholder commercialisation of Agriculture

Different models for the commercialisation of agriculture have been used by various parts of the world. While other nations, like Brazil, have achieved success by investing in large-scale commercial farming, some, like South East Asian region, revolutionised the agricultural sector through commercialisation of smallholder during the green revolution in the 1960s (Asfaw *et al.*, 2012). In addition to contract farming and out-grower farming, which have both been widely used, especially in SSA, medium-scale commercial farming is currently on the rise (Leavy and Poulton, 2007). Commercialisation pathways vary and are dependent on interconnected structural and

social interpersonal factors. During the process, the labour regime of a household is changed from predominantly family labour (prevalent in polygamous homes) to hired labour. Hired labour is typically supplemented by regime and, in certain cases, collective work parties. Today, labour shortages are regularly cited as a barrier to commercialisation (Scoones *et al.*, 2017).

In food production systems, smallholder commercialisation occurs at three different stages (Hagos and Geta, 2016). Subsistence, semi-commercial, and commercial farming are the three farming levels that are determined by the goal of the smallholder household to cultivate a certain crop, the source of household inputs, the source of household revenue, and the product mix.

The commercialization of smallholders took a unique course. The typical path of smallholder commercialization begins with a rise in agricultural product market access. This could be accomplished by growing a marketable surplus of staple food crops and continuing to do so until it represents a significant portion of the family total agricultural output. Another path for smallholder commercialization and/or market-oriented production system is to diversify the marketed portion into other food crops and staples; producing cash and high-value crops is another avenue for smallholder commercialization. However, even though these paths of market orientation of smallholder households may seem straightforward, they may not be appropriate in many developing nations (Hagos and Geta, 2016).

According to Endalew *et al.* (2020), the transition to semi-commercial farming from subsistence and finally to completely commercialised agriculture typically takes a longer time. The goal of subsistence production is to achieve self-sufficiency in food production for the household through the use of non-purchased inputs and inputs generated by the household. This goal, as well as the sources of input, differ in farms that have converted into semi-commercial farms, creating excess outputs while employing both purchased and non-bought agricultural inputs. In fully

commercialised farms, the primary goal is to maximise household profits, and inputs are primarily sourced from markets.

Kotchikpa and Wendkouni (2016) investigated factors inducing the commercialisation of smallholder production in Cote d'Ivoire and concluded that agricultural commercialisation occurs when smallholder households create a surplus output to be marketed. According to the indicator of household commercialisation, farmers were classified into three categories: commercial farmers, semi-commercial farmers, and non-commercial farmers. An index of one represented complete commercialisation, while a zero-index represented non-commercialisation. This criterion is backed by Lawal *et al.* (2014) and Martey *et al.* (2012), who stated that commercialisation is based on the amount of output sold by farm households relative to overall production. Furthermore, Ochieng *et al.* (2015) stated that farm commercialisation is about market orientation and engagement. The researchers used the Household Commercialisation Index to determine market-orientation in legumes and bananas farming. Kunze (2003) added that the agricultural commercialisation process has four dimensions: producing market surpluses of traditional crops and livestock, adding value to traditional crops and livestock before sale, producing livestock and new crops specifically for market, and finally, introducing new enterprises to generate income.

2.4 Measurement of Agriculture Commercialisation

The importance of quantifying smallholder commercialisation level stems from the desire to make comparisons amongst farm households based on their level of commercialisation. A variety of methodologies are employed to assess the degree of agricultural commercialisation. This assists in determining the degree to which a particular farm household is commercialised in all of its production, consumption, and marketing decisions, as well as examining the determining factor of commercialisation (Jaleta *et al.*, 2009).

The degree of specialisation or income diversification in agricultural production is one of the four approaches used by Gabre-Madhin *et al.* (2009) to measure commercialisation at the household level. The other approaches are the sale-to-income and sales-to-output ratios, absolute and net market position (i.e., whether the household is a seller, net purchaser, or self-sufficient (autarkic). Gabre-Madhin *et al.* (2009) also said that the output-sale ratio is a measure of a household's gross value of total production sold as a percent of its total gross value of agricultural output. This is comparable to the idea presented and described by von Braun *et al.* (1994) as the percentage of output sold to total household agricultural output. The sales-to-income ratio compares the total crop income to the gross value of all sales. Crop revenue is assumed to be a proxy for total household income in this case, ignoring off-farm and non-farm revenue, as well as revenue from animal sources. The ratios of sales volume and purchase volume to total stock volume - sum of storage of previous year production and current year output - are used to determine household market position. The specialisation index reflects the benefits of comparative advantage by measuring the degree of specialisation in production of households (i.e. households producing what they can produce efficiently and purchasing what they cannot produce efficiently). The specialisation index calculates the fraction of the total value of agricultural output that is spent on agricultural products that are not produced by households.

Adong *et al.* (2021) argued that measuring smallholder agricultural commercialisation can be done along a range starting at zero for complete subsistence farming and ending at one for 100 percent sale production output. Konja and Mabe (2023) employed the Household Market Participation index (HMPI), which is a measure of commercialisation, by dividing the value of the crop sold by the total value of the crop produced. This strategy is useful because it "eschews the use of simple distinctions as commercialised and non-commercialised farms." However, this method has a

drawback. For example, if a smallholder farmer receives 10 bags of maize and sells all of them, and another smallholder grows 100 bags but only sells 30 of them, the CCI will conclude that the first farmer is more commercialised (100 percent commercialised) than the second farmer, who only sold 30 percent of the maize produced. In cases like this, such interpretation is illogical. Govereh *et al.* (1999) highlighted that, despite this drawback, the CCI is still used, particularly in emerging economies including Ghana, where the likelihood of smallholders selling all of their products is low and the chances of large farms selling no production is low.

The typical technique to gauging commercialisation is the extent of output market involvement, as demonstrated by the following argument. Agriculture commercialisation, as defined by von Braun *et al*. (1994), is the percent of total harvest of agricultural products traded by the household or the percentage of cash crop cultivated by the household in comparison to total farmed crops. Von Braun *et al.* (1994) measured commercialisation and integration into the cash economy in four ways, measuring the level of their occurrence at the household level as follows:

1) $Agriculture\ commercialisation\ (output\ side) = \frac{value\ of\ agricultural\ sales\ in\ the\ market}{agricultural\ production\ value}$

2) $Agriculture\ commercialisation(input\ side) = \frac{value\ of\ inputs\ acquire\ from\ market}{agricultural\ production\ value}$

3) $Agricultural\ of\ rural\ economy = \frac{value\ of\ goods\ and\ services\ aquired\ through\ market\ transactions}{total\ income}$

4) $Degree\ of\ integration\ into\ the\ cash\ economy = \frac{value\ of\ goods\ and\ services\ acquired\ by\ cash\ transactions}{total\ income}$

2.5 Factors influencing agricultural commercialization

Several factors influence smallholder agriculture commercialisation. These factors have been roughly classified in the literature as internal and external influences. External factors include growth in population and demographic changes, technology advancements, the introduction of new products, market institutions and infrastructure development, the expansion of non-farm sector and the wider economy, an increase in the opportunity costs of labour, trade, macroeconomic, and sector policies influencing prices (Moti *et al.*, 2009; Pingali and Rosegrant, 1995). These issues are beyond the smallholder farmers' control. External factors that could affect agricultural commercialisation include input and output market development, market regulations governing land tenure and property rights, social and cultural factors influencing preferences in consumption, , agro-climatic conditions, market and production risks, production and market opportunities and constraints (Pender and Alemu, 2007). Internal elements are those over which smallholder farmers have control, and they include land and other natural capital, labour, human capital and physical capital. These elements also have a substantial impact on the level of commercialisation.

Opondo *et al.* (2017) conducted a study in Kenya to investigate farmers' income and cassava commercialisation among smallholder farmers. According to the study, farmers who commercialised cassava earned much more than those who did not. Several factors were also discovered to have a substantial impact on commercialization. Farm size, years of education, remittances, and group membership all had a positive and significant bearing on cassava commercialisation. Distance to market, on the other hand, had a negative influence. Mbegallo, (2016) investigated the status, factors, and impact of agriculture commercialisation among Tanzanian smallholder farmers. The findings revealed that the age, gender, number of people in

the household, area of land cultivated, inorganic fertiliser, improved seed, and agricultural input credit all influenced farmers' decision to involve in agricultural commercialisation of four commodities significantly.

Kavuma and Kisaami (2023) study on cassava and maize commercialisation in Uganda found commercialisation of the two crops to be low, estimated at 11 and 14 percent respectively. Using the Tobit regression model, factors including gender, land productivity, household size, location of farmer, value of asset, marital status and soil type drives the commercialisation of these two crops. They showed that the key driver of agricultural commercialisation is land productivity and consequently recommend to policymakers to formulate policies for improving land productivity. They further noted that female headed households, households outside the central region, or households with many members hamper the agriculture commercialisation.

Using a multistage sampling process, Hussayn *et al.* (2020) collected data from 189 farmers using a structured questionnaire. They examined the data using household commercialization index, and Ordered Probit model. The results showed that greater percentage of farmers have commercialise at high level (58%). Farming experience, educational level, amount of cassava harvested, extension visits and farm income contributed to commercialisation among the cassava producers.

Zakari *et al.* (2023) state that in Niger Sahelian region, market involvement is favourably and significantly influenced by variables such as total amount of crops harvested, gender, credit access, farmer experience, drought, household assets and training. Their findings point out that increasing output of crop produce will enhance market participation since crop sales are correlated positively and strongly with crop production. The only way to do this is to incentivize farmers to take part in CF and use high-yield crop varieties—like those that are climate-resilient—to increase production. Moreover, given the positive link between credit availability and household partaking in the

market, any initiative that aims to offer farm households with farm inputs and credit will certainly support increase productivity and smallholder involvement in market.

Adong *et al.* (2021) utilised two waves of panel data (2005–06 and 2009–10) and investigated the drivers of food crop commercialisation in Uganda. The ordinary least squares (OLS) and binary logistic regression model were adopted to analysed the drivers of the incidence and degree of market engagement among producers that cultivate bananas, sweet potatoes, cassava, beans, and maize. Their results indicate that household characteristics (gender, age, and education), the characteristics of farm (farm size, distance to feeder road, road in the community, ownership of cattle, exposure to drought, and having three meals a day), and the characteristics of the community (region) all have an impact on the commercialization of crop production.

Tafesse *et al.* (2023) analysed maize farmers' market participation using sample selection econometric model (Heckman two-stage) and inferential statistics in Southern Ethiopia. They found that sex and age of household, price of maize, number of people in household, farmer experience, market distance, availability of transport, extension contacts, the size of the land, credit received, market information, and income from off-farm were among the variables that were found to significantly determined market participation of maize farmers. According to the results, two crucial pieces are desired to better maize marketing: availability of market information and improvements in road infrastructure in areas with potential for maize production.

The impact of market information on smallholder maize commercialisation was analysed adopting the DHM by Morton and Martey (2021) in the northern and savannah regions of Ghana. Demographic, location dynamics and institutional factors were found to affect access to market information by smallholder farmers. The findings additionally showed that market information and extension boost the proclivity of the smallholder growers to engage in the market. The decision

to engage in the market by smallholder farmers was strongly triggers by the availability of marketable surplus. Particularly, the farmers experience significantly drives the level of farmers' market participation. Hagos *et al.* (2020) noted that factors such as asset ownership (e.g. mango seedlings availability and number trees that are productive), resource ownership (e.g. land fragmentation and size of mango farm), assistance from experienced persons in the community, income from various agricultural products and access to based organisations are the most significant factors impacting participation in the market by mango growers.

The determinants of market involvement among plantain farmers have also been looked at by Oduntan and Alade (2020) in Nigeria. These authors applied the truncated regression method and found that farmer age, total harvested plantain, land allocated for plantain production, output price of plantain, farmer experience and distance from the farm all had an impact on the proportion of plantain marketed by the producers. Their conclusion was that although the amount of plantain marketed by the producers was high (64.6%), it was not sufficient, therefore demands for all parties involved to act to increase plantain productivity within the research area. According to Megerssa *et al.* (2020), the market participation of smallholder vegetable farmers was statistically influenced by a number of variables, including number of people in household, age, educational attainment, market information, the labour market and distance from the marketplace.

Konja and Mabe (2023) employed the generalised DHM to examine the drivers of groundnut producers' involvement in the market. They found that on the average, 62 percent of groundnut produced in northern Ghana was marketed by farmers. The most significant drivers of the decision to participate and level of groundnut market participation include output market distance, extension contacts, membership to farmer group, market price of groundnut, income from off-farm activity, improved seed, and availability of transport. They recommended that policies and

strategies targeting at supporting the commercialisation of smallholders should concentrate on improvement in rural infrastructure, market-oriented extension services, and developing farmer-based-organisations for collective action including marketing of groundnut.

2.6 Models of Agriculture commercialisation

Since the mid-2000s, the increase in land acquisitions and agricultural investments by corporate entities in SSA has raised the promise of a revival of large-scale commercial and plantation farming (Cotula *et al.*, 2015). While this might be seen as a chance to motivate rural communities, activists and researchers have articulated fear that land expropriation impends food security as well as livelihoods, and that small farmers may be exempted from the development process (Oakland Institute, 2009). According to Oya (2012), commercialisation of agriculture involves several institutional configurations, each with its own set of labour regimens and implications for the tenure system, agricultural architecture, and land concentration. Plantation farming, commercial farming, and contract farming are the three agricultural commercialization models identified by Smalley (2013).

2.6.1 Plantation Farming

According to Hall *et al.* (2017), the history of African plantation farms and estates can be traced back to the colonial period, beginning from the colonial concession areas, and have widely been regarded as efficient in offering a significant amount of employment (wage work), frequently fusing casual labour with permanent labour. Simultaneously, due to the amount of land needed for capital buildup in such methods of farming, plantations repeatedly dislodge local farmers.

Plantation farms engage in monoculture, require a large capital investment, are bigger than the usual (mean) farm allotment (although certain lands could be lying fallow), count on hired labour (non-resident or resident, migrant labour included), and are principally controlled (Smalley, 2013).

Plantation ownership might be corporate or private, and it can be domestic or foreign (Smalley, 2013). Plantations frequently include the establishment of non-indigenous crops, the conversion of lands to monoculture farming, and the establishment of a new labor force (Daviron 2010).

Thompson (1941) observed that plantations typically produce crops or products destined for the export market. However, Smalley (2013) disputed this and indicated that it was clearly the goal of colonial plantations founded by European settlers in Africa. The second phase of African plantations was the advent of imperial capitalism. Plantations were becoming the target of international enterprises during this period (Brass and Bernstein 1992; Loewenson 1992). The plantation industry was shattered in the post-colonial phase, which can be classified as the third phase, with new types of ownership (domestic private ownership) and state-owned plantations. The many post-colonial plantations are strongly associated with agribusiness.

Plantations have historically relied on abundant labour and land for their labour-intensive methods of production (Hayami, 2010; Marini 2001). Though the stability of these production elements is projected to shift toward capital because plantations embrace technology and mechanisation, the process does not proceed consistently throughout time, and the outcomes are not always obvious (Smalley, 2013). Plantations use mechanized ploughing, pesticides, or chemicals, which are capital-intensive yet labour-saving technology (Wunder, 2001).

The seasonality and intensity of labour on plantations vary to certain degree depending on crop type farmed and whether or not irrigation is used. There are no conclusive listings of plantation crops in Africa, including Ghana, however tea, coffee, jatropha, oil palm, rubber, banana, cocoa, sisal, pineapple, tobacco, and sugarcane are common in plantation farms (Hayami, 2010). However, the literature warns against using agricultural attributes to justify the establishment of plantations.

Hall *et al.* (2017) provided evidence that plantations may involve the whole purchase of land and its resources, the displacement of other land users, and a natural lack of integration of plantations into the local economy and community. Plantation value chains' reliance on global markets is one of the main causes of plantations' little contribution to the local economy. Ferguson (2006) attacks plantations for creating "enclave economies"—where goods are marketed on national and international markets rather than local ones, and inputs—including migrant labour—are obtained far from the field. This means that, though plantations could attain higher output and productivity levels, their capacity to support vibrant local economies and better and more diverse livelihoods in the surrounding areas is undermined by weak forward and backward linkages (Hall *et al.*, 2017).

2.6.2 Commercial Farming

Commercial farming has been a notable feature in Africa throughout the twentieth century, with varying levels of development across different regions. Historically, sections or blocks of commercial farming have been reported in several African countries, particularly where land tenure systems, government policies, and private sector investments have encouraged large-scale or medium-scale production (Smalley, 2013). In recent years, there has been a significant rise in both commercial farming activity and political discourse surrounding its role in agricultural transformation and economic development.

The structure of commercial farming in Africa is characterized by clusters of large-scale and medium-scale private farms, which are often located in specific agricultural zones. These farms tend to be contiguous or nearly contiguous, meaning that land parcels are adjacent or within close proximity to one another, forming a concentrated commercial farming hub. Land acquisition for these farms typically occurs through rental agreements or outright purchase, allowing for formalized ownership and investment in long-term agricultural production (Hall *et al.*, 2017).

A key feature of commercial farming is specialization in the production of specific crops, often driven by market demand, agroecological suitability, and government incentives. For instance, in regions with well-established commercial farming activities, clusters of medium-scale farmers may focus on high-value cash crops such as maize, cotton, oil palm, horticultural crops, or livestock production, depending on the comparative advantage of the area. The existence of such clusters is often influenced by access to infrastructure (roads, irrigation, storage), input supply chains, and proximity to markets or agro-processing facilities.

Furthermore, the expansion of commercial farming in Africa is shaped by broader economic and policy trends, including land tenure reforms, foreign direct investments (FDI) in agriculture, and contract farming arrangements that link commercial producers to global and regional markets. While commercial farming has the potential to enhance productivity, create employment, and contribute to food security, it also raises concerns regarding land access for smallholder farmers, environmental sustainability, and equitable distribution of benefits.

2.7 Concept and Overview of Contract Farming

Contract Farming has been defined as a contractual agreement formed before going into production between a producer (farmer) and buyer describing the quality, quantity, and time in which the product will be provided to the customer at a certain price agreed before the production of agricultural output (Ganewo *et al.,* 2022). This CF description is pretty clear and concise, however it does offer little information on the customer. Nonetheless, this definition outlines important strategic components incorporated in the two parties' agreement. According to Ton *et al*. (2018) and Gramzow *et al.* (2018) noted that a CF scheme is an arrangement between processors or marketers and producers to grow and supply agricultural produce at specified pricing. This form of definition does not involve aspects of the agreement but is more specific about the buyer's

character. The buyer could be a processor or a marketer. Growers agree to a verbal or written contract to produce and sell goods to a purchaser on a set date and to a specified quality and quantity, characteristically at a predetermined price.

Eaton and Shepherd (2019) noted that CF is a key agricultural institution that widely has been widely in both developing and developed economies at various epochs for better performance and coordination of markets of agricultural products as well as tackling various forms of market failures. CF is primarily a risk-sharing arrangement between the investor and the farmer; consequently, the farmer bears the risks in production while the investor bears the risks in marketing (Baumann, 2000). In his definition of CF, Singh (2002) labelled CF as a forward contract involving the growing and supply of agricultural products at a specific price, time, quantity, and quality in order to deliver the commodity to a customer. Such an agreement can be oral or written, and it can include specific marketing or production constraints. In other words, according to Singh (2002), contract farming provides an agribusiness organisation or individual entrepreneur with unrivaled control over production and marketing, providing them with the prospect of guaranteed available supply at the appropriate time, quality, and quantity.

CF could be modified in many different ways, including large-scale land purchase known as nucleus outgrowing, in which core estate production is supplemented by contracted smallholder farmers (Smalley, 2013). However, as the author points out, it may be overly optimistic to believe that contract farming will foster agricultural commercialization and the creation of competitive marketplaces and producers.

According to Shaba *et al.* (2017), smallholder contract farming was established to address market gaps. The contract structure provides farmers with financial access because the contract is utilized as collateral to acquire loans from the bank. Smallholder growers who benefited from credit and

inputs could attain higher levels of productivity and income than if they did not produce under contract. Farmers are tied to capital via contract under a contract farming arrangement, which provides smallholder farmers with chances to accumulate and in terms of integration that may be less or more profitable, depending on the arrangement made by the institutions involved (Oya, 2013). CF farmers are allied to a processing company, which develops a nucleus estate on occasion, however supply is supplemented by contract farmers or outgrowers who give their crops to the company. Such arrangements not only create job chances as wage workers in processing mills, but also in the nucleus estate season and permanent jobs. The conditions of the outgrowing contract are enormously variable, with varying distributions of advantages and hazards influencing the forms of class associations in rural communities (Oya 2013; Smalley, 2013).

Contract farming agreements help to increase vertical cooperation between marketing and processing firms and producers (Bijman, 2008). As a result, contract farming is, in theory, a fundamental condition for increasing agricultural output, food security and economic development. In this framework, CF participation frequently is associated with improved food security, increased income from farm, and rural poverty reduction (Maertens and Velde, 2017).

Contract arrangement can be oral or written contract between a farmer or farmer group and a marketing and/or processing organisation, commercial or otherwise, for the production and sale of agricultural goods under pre-specified parameters, typically at fixed rates. The contract could also include the purchaser providing certain degree of production assistance, such as the delivery of inputs and technical support. Thus, the foundation of these agreements is the farmer's promise to supply a certain good in the quantities and quality standards specified by the buyer, along with the firm's promise to support the farmer's production and buy the good (Narayanan, 2014). Contract farming provides the farmer with the necessary help in terms of quality inputs, extension delivery,

and a guaranteed market for their products, while the company obtains a guaranteed supply of raw materials. Contracts for interconnected input and output marketplaces can yield efficiency benefits that could be apportioned by farmers and firms (Barrett *et al.,* 2012).

Taking the aforementioned concepts into consideration, this study defines contract farming as any pre-production partnership between an Agribusiness Company or an individual entrepreneur and a farmer to supply production inputs to the farmer, which are paid in kind using the value of the inputs provided after harvest. This agreement might be written or verbal, and it must be clearly understood by all parties involved.

Baumann (2000) distinguished three different types of CF: production management, market specification and resource provision contracts. The market specification contract guarantees smallholder farmers a market as long as their products match certain criteria. Contractor engagement is mainly limited to crop grading at the marketing stage. Inputs for agricultural output are offered to smallholders in the form of loans and, in some situations, working capital under the resource-based contract. The advance credit is repaid after the farmer's produce is sold. Farmers may also receive extension assistance, and the likelihood of technology transfer is high. Production and management contracts are a mixture of market specification contracts and resource-based contracts.

2.7.1 Models of contract farming

CF programmes have been divided into five primary models in the literature (Will, 2013; Bijman, 2008; Eaton and Shepherd, 2001). This classification is built on the type of contractor, the intensity of vertical coordination, the product type that is best suited for, and the number of important stakeholders involved. These five fundamental models are the core estate, the centralised estate, the informal estate, the multipartite estate, and the intermediary estate.

2.7.1.1 The Centralized model

This is the traditional contract farming arrangement in which a processor acquires products from a large number of smallholder farmers. In this approach, there is stringent vertical coordination, suggesting that quality control is strict and quantity determination occurs at the commencement of the production season. Naturally, the intensity of processing for commodities exchanged under this approach is extensive. Because of the importance of scale economies in processing, as well as the enormous volumes of consistent product required, processors generally prefer to obtain from large-scale commercial growers.

2.7.1.2 Nucleus model

The contractor in this CF model has its own production facility called a plantation estate and sources output from individual farmers. The estate plantation is what guarantees produce for the contracting firm, but the estate plantation is also used for breeding and research. The firm is usually a farm owned by the state that has transferred land to former employees under the nucleus estate concept. This paradigm is mostly used for perennial crops, while examples of other crops exist. A dairy nucleus estate in Indonesia, for example, where the core estate is predominantly utilised for the production of "parent stock" (Eaton and Shepherd, 2001). However, according to Bijman (2008) vertical coordination varies under the nucleus estate model.

2.7.1.3 Multipartite model

In this contract farming model, a statutory authority joins forces with a commercial firm to form a joint venture and enter into contract agreements with producers. Similarly, the arrangement may include commercial or public credit providers, inputs, and extension services. As part of the liberalization process in many developing nations in the 1980s and 1990s, governments aggressively invested in contract farming in collaboration with the private sector (Little and Watts,

1994). In China, local committees and government departments established joint ventures with both foreign and domestic financiers to set up a processing plant and enter into CF agreements with farmers (Sonntag and Kulke, 2021). Vertical coordination is likely to be intense if the joint venture has a wide range of options for regulating its transactions with producers. If the joint venture is a public-private partnership, the contractor-farmer relationship may be influenced by the partner's political interests.

2.7.1.4 The informal model

This contract farming approach is exemplified by small enterprises or individual entrepreneurs who enter into informal seasonal contracts with farmers. Crops under this strategy are often processed minimally, including packaging, grading, and sorting (Bijman, 2008). However, the success of this type of model is dependent on the handiness of support services, which in many circumstances are expected to be delivered by agencies of the government (Eaton and Shepherd, 2001). Individual entrepreneurs, on the other hand, are usually forced to rely on extension services provided by the government, whereas corporations that use the centralised type model will surely hire extension agents of their own (Bijman, 2008). Because this relationship is not formal, it offers less opportunities for vertical coordination than one with a formal association with the farmer. In general, the government provides support services, and the default risk for farmers and contractors in this style of farming is significant (Will, 2013).

2.7.1.5 The Intermediary model

In this type of contract farming arrangement, at least three parties are involved, which may include a trader or processor who has a contract with a collector (intermediary organization), which may include farmer committees, who then contracts a few farmers informally. Middlemen act as go-betweens between farmers and businesses (Mansul *et al.,* 2009). As a result of the link between

farmers and contractors, the model is plagued with various difficulties for vertical coordination and providing appropriate incentives (Bijman, 2008). According to Bijman (2008) and Will (2013), problems of vertical coordination, such as support services and input supply, usually arise from this model, and smallholder farmers may not benefit from market prices and technology transfer because middlemen or collectors may try to increase their margins.

2.8 Empirical studies of contract farming arrangement

In essence, CF is an agreement wherein a buyer and a grower agree on the quality, amount, and date of supply of agricultural products at prices predetermined (Ayamga, 2023). A farmer who enters into a contract farming arrangement promises to offer the purchaser with a particular agricultural output in a defined quantity and quality within a predetermined amount of time. In return, the purchaser consents to secure the goods at the agreed-upon price. In certain cases, the buyer agrees to provide materials, technology, and assistance to farmers in carrying out specific farm tasks, such as clearing land (FAO, 2016).

Contract farming is advocated as the preferred institutional instrument for making smallholder development viable in the face of globalisation from the standpoint of neo-populism. Contract farming is thus considered as a production system that cannot be divorced from bigger arguments regarding the growth of smallholder farmers. According to Ayamga (2023), contract farming is believed to offer benefits, such as facilitating the connection between smallholder farmers and markets. A wide range of market obstacles, including those pertaining to agricultural inputs, insurance, technology, and credit availability, affect smallholders and medium-sized farmers in Africa. CF is one viable approach to remove these restrictions and barriers in market (Ncube, 2020).

However, Zhou *et al.* (2013) indicate that smallholder farmers that have income from off-farm are more liable to gain from contract farming due to production support from other sources. This suggests that smallholder farmers are vulnerable in terms of contract farming talks for fair deals because their bargaining strength is limited or inadequate under credit circumstances of food production. This is supported by Smalley's (2013) findings that outgrowing contracts are significantly diversified, with distinct risk and benefit distributions. As a result, there are contract farming situations in which out-growers have the freedom to move in and out of purchasing agreements with smallholder farmers and sell produce into local marketplaces, typically under 'loose' contracts. Iddrisu *et al.* (2018) found that farmers' contractual arrangement with Masara N'Arziki of Wienco Company in northern Ghana is more effective in terms of bargaining power for fixed price only after harvest. That instance, when they realized that their yields were low or unprofitable, necessitating negotiating to reduce losses.

According to Ferris *et al.* (2014), contract farming offers smallholders with a direct sales agreement for a specified market. This also assures an efficient marketing system with fair prices, quality standards, and sales negotiated between the farmer and the customer. Contract farming works at a higher level with an intermediary firm that secures the market and then aggregates volumes of individual or groups of smallholder farmer output. These intermediate enterprises are distinguished by their input-credit assistance and knowledge transfer, and they operate in a way that greatly r educes risks for smallholders (FAO, 2013). Iddrisu *et al.* (2018) discovered that farmers who worked in mutual agreement in the northern region with the Masara N'Arziki project were assured of a ready market with guaranteed prices; however, the guaranteed prices offered for their farm output could not meet the farmers' expected household incomes. This means that a

contractual farming model with a ready market after harvest has the potential to impact commercial production by smallholder farmers.

The CF study by Adams *et al.* (2019) elucidates the ways in which outgrower contract farming generates localised dependence. Using Malawi's sugarcane as a case study, it is demonstrated how the reinterpretation of financial flows into outgrower communities and the use rights to customary land lead to the creation of dependency. By use of this two-pronged approach, corporations are able to get land, exercise authority over nearby communities, and alter the reciprocal social links that are the foundation of opposition. The findings also show that CF modifies local family institutions and rural agricultural relations by selectively displacing the impoverished community members and carefully choosing a small number of influential household members to participate in the programme.

Despite constraints such as imbalanced power relations between smallholder farmers and major corporations, smallholder farmers' limited bargaining power frequently leads to unhappy output prices when market prices shift (FAO, 2013). Farmers are drawn to contracting, however, since it allows them to access a more constant market through competitive pricing, with farmers receiving somewhat better rates than the prevailing market prices. Due to the very volatile informal market condition, Hall *et al.* (2017) confirmed price decisions made by farmers who agreed to these contractual agreements. Others studies such FAO (2013) and Ferris *et al.* (2014) however, say that CF has the drawback of restraining smallholder involvement to the start-up period until the market is filled by larger and more competitive farmers.

Contract farming in northern Ghana has provided some opportunities for commercializing smallholder agriculture, particularly private agribusiness and out-grower firms. This methodology is widely used in seed production for both cereals and legumes in community-based improved

variety demonstrations. However, smallholder farmers have reportedly encountered contractual difficulties when interacting with large agribusiness businesses, leading to some of them abandoning contract farming due to transaction costs and obstacles (Iddrisu, 2016). There is a reciprocal relationship with agribusinesses experiencing production issues when interacting with smallholder farmers, which could result in contract cancellation after one cropping season. According to Ba *et al.* (2019) and Elepu and Nalukenge (2009), this is frequently ascribed to one of the parties failing to honour the contract terms, such as the agribusiness enterprise or the smallholder farmer failing to honor the terms and conditions of the production agreement.

In Ghana's northern area, Azumah *et al.* (2016) looked into the causes of and effects of CF on farm household income. It was discovered that CF engagement was favourably correlated with credit availability and extension contacts. Contrarily, CF participation was negatively impacted by off-farm income and farm size. Farmers who took part in the contract farming system made more money than those who did not, according to the research. By offering support services including access to financial facilities and extension services, they suggested allowing farmers to engage in contract farming.

Furthermore, Azumah *et al.* (2017) did a study on CF and climate change adaptation and coping techniques among 240 crop farming households in Northern Ghana. The researchers utilized a simultaneous equation method to investigate the relationships between climate change adaptations and coping methods and CF. The findings indicated that CF increases the adoption of adaptation strategies to climate change; nevertheless, there was a response impact on CF, such that farm households that adopted more strategies had a greater likelihood of joining in CF.

2.9 Factors motivating smallholder households' involvement in CF arrangement

Profit maximisation is the primary purpose that inspires an agribusiness corporation to get into a contractual relationship with smallholder farmers to produce agricultural products. A well-managed contract structure is a seemly technique to coordinate and boost marketing and production agricultural commodity (Mugwagwa *et al.*, 2020; Eaton and Shepherd, 2001). Both the agribusiness corporation and the farmers have motivation to participate in agricultural contracts.

A study by Mazwi *et al.* (2018) examined land use patterns, livelihood outcomes, and power dynamics among tobacco farmers who were producing under contract in Zimbabwe's Zvimba and Goromonzi districts. The study sheds light on contract farming by examining farmers who were not producing as required. Improved extension contacts and more reliable access to output and input markets are blamed for the increase in CF. Concurrently, contract farming for tobacco is characterised by a number of ups and downs. Due to their high cost of inputs and poor prices of output, which led to debt, some farmers chose to withdraw from the contracts (Mazwi *et al.*, 2018). In a similar vein, the authors noted that a few contracting companies withdrew from the agreements. In general, more contracted growers than non-contract farmers accumulated.

The majority of scholarly works on impact of CF on participating smallholder farmers provided additional data on elements influencing CF engagement. For example, Casaburi *et al.* (2014) observed in western Kenya that the mean contracted farm size contracted of a big sugar corporation had decreased over time. This meant that households which have small farm size were more likely to be motivated to join in the CF agreement and were less expected to drop out once the contract farming processes were enhanced.

Furthermore, literature on contract farming arrangements has identified three primary motives for farmers to join in CF, which include risk management, transaction costs, technological

advancement, and a positive impact on production efficiencies (Abebe *et al.*, 2013; Hu, 2013). Abebe *et al.* (2013) have advanced a positive approach to smallholder engagement in CF so as to improve their livelihood. The authors demonstrate that smallholders were more eager to join in CF if contract design includes qualities such as seed supply, inputs, written form, technical support, flexible price alternatives, and output quality.

According to research conducted in Ethiopia, the possibility of engaging in malt barley CF arrangements is positively correlated with experience in producing barley, credit utilisation, family size, livestock ownership, extension visits, as well as land allocated for the production of barley malt (Ganewo *et al.*, 2022). In contrast, they also found a negative correlation for distance to the barley malt collection locations, suggesting that the chances of engaging in barley malt CF declines with increasing distance. The dietary and income diversity of the smallholder families are positively impacted by contract farming of malt barley, according to the ATT calculation of the PSM.

Schipmann and Qaim (2010) identified input provisions, payment form, pricing, and farmer-trader relationship as contract qualities significant in motivating farmers to join CF. Barrett *et al.* (2012) identified insecured land tenure, a lack of insurance and credit (institutional limitations), and a lack of assets (physical constraints) as factors restricting smallholder involvement in CF in India, Mozambique, Ghana, Nicaragua, and Madagascar. According to the authors, farmers who had access to these characteristics were inclined to participate in CF in these nations. The smallholder farmer's age, farmer-based-group, and experience were all important variables in farmers' decision to join in tobacco CF in Tanzania (Sambuo, 2014).

Miyata *et al.* (2009) investigated the influence of CF involvement on smallholder's green onion and apple farmers' income in China. The discovery was that entry into the CF scheme was

dependent on labour availability and geography, rather than level of education or farm size. As a result, this shows that firms were not favoring farmers with vast farms. According to Saenger *et al.* (2013), smallholders may have a relative advantage regarding labour-intensive crop production because of low cost of supervising and evaluating family labour. Contracts were imposed in the marketing of traditional Ethiopian vegetables mostly through broker mediation and mutual trust (Haji, 2010). The World Bank (2008) observed that CF involvement in East Asia and Latin was based on available infrastructure and the capital/labour ratio rather than land. Farmers with access to infrastructure, such as better roads and a high capital/ratio, were willing to engage in CF agreements.

Puspitawati (2013) counted sixteen elements that encourage farmers to participate in CF in Indonesia in his thorough study on motivation of farmers to engage in potato CF with agro-food enterprise. As previously discussed in combination with other writers, the primary concern of potato producers appears to be the availability of a stable market and access to trustworthy input. Other concerns mentioned included market uncertainty and prices.

Participation of smallholder farmers in China's onion and apple CF scheme was affected by available labour, distance to the village chief house and whether the household possessed agricultural equipment (Miyata *et al.,* 2009). The share of family income from agriculture and family resource endowments were key determinants influencing farmer involvement in the SIPI certified organic coffee production CF scheme in Uganda (Bolwig *et al.*, 2009). Vegetable CF agreement have also been observed to favor large farms, with farmers achieving higher yields in India (Narayanan, 2014).

Age, gender, agricultural experience, cooperative involvement, operating capital, land endowments, days farmers have not worked for reasons relating culture, entrepreneurial or

business skills, and risk attitude were factors significantly driving CF participation in a study conducted in Madagascar by Bellamare (2012). Barrett *et al.* (2012) commented on the inclusivity of the CF system, stating that very few farmer, farm, or household variables have consistently affected participation in the CF system.

According to a research done by Mazwi *et al.* (2018) in Zimbabwe, farmers who participated in tobacco contract farming were leaving the arrangement due to inability to meet production targets, low productivity, high prices of input because of interest charged on inputs, low prices of output, and failure to repay loan. These have emphasized contract farming's unfavorable composition for smallholder farmers. Low output and high input pricing may be the new approach for agribusiness businesses to abuse farmers through excess value extraction. Many researchers working on the same topic have raised this issue. Contracting firms use monopsony to lower output prices while rising input prices, reducing smallholder farmers' income dramatically (Goger *et al.*, 2014).

According to other studies, agribusiness corporations engage smallholder farmers just when they want to enhance production supply, and they withdraw from the partnerships once the company's production needs are filled, exposing the smallholder farmers to poverty (Martiniello, 2016). Smallholder farmers, on the other hand, are not authorized to resign from the arrangements, showing unequal power dynamics. Contracts between contracting companies and smallholder farmers are frequently drafted in English, which many smallholder farmers may not comprehend. This implies that smallholders may enter into contracts without fully comprehending them, emphasizing the unequal power dynamics in the arrangement (Mazwi *et al.*, 2018).

Farm sizes are tiny in low-income countries, and farmers produce primarily for domestic consumption, selling any surplus at a cheap price in local marketplaces. Contract farming provides these farmers with a once-in-a-lifetime opportunity to produce high-quality crops while receiving

greater prices from processors (Wang *et al.*, 2014; Miyata *et al.*, 2009). Contract farming allows farmers to produce higher-quality food by encouraging farmers to create farmer groups, supplying them with inputs, and offering technical support. Contracting, according to Eaton and Shepherd (2001), is a reasonable means of assisting farmers in accessing new lucrative markets that would otherwise be unavailable to them. According to Will (2013), access to such marketplaces encourages farmers to engage in CF.

2.10 Impact of CF on the smallholder farm households

Danso-Abbeam *et al.* (2022) analysed the implications of CF on the welfare and cashew farm performance in Ghana. They discovered that CF enhances farm performance, which includes productivity, net profit, and price margins, as well as household wellbeing, as shown by consumer spending per capita. Probit-two-stage least square was used as the major estimator to account for endogeneity and self-selection bias that may arise from both observable and unobserved heterogeneities across farm families in order to evaluate the causal implications of CF on farm performance and family wellbeing. They found that the non-contract farmers would have benefited greatly had they participated in cashew CF. However, when the farm sizes are evaluated in terms of the outcome determinants and classified as small, medium, and large farms,

To account for any selection bias and variability within the household, Dubbert *et al.* (2023) study applied marginal treatment effects technique to examine the influence of CF participation on sustainable farming practices. The empirical findings indicate a considerable degree of variety in the ways that contract farming affects the extent to which sustainable agricultural practices are used. Specifically, farmers who have a strong inclination towards contract farming are less likely to employ sustainable farming practices.

Azumah *et al.* (2016) used the treatment effect estimator and estimated the causes and effects of CF arrangements on farm revenue. They discovered that contract farming increases crop productivity in Ghana's northern area. The authors implied that the improved yield was due to the inputs credit CF farmers received from the contracting company as part of the contract agreement to aid them in production.

According to a study by Azumah *et al.* (2017) on CF and adoption of coping and adaptation methods for climate change, CF can help with the adoption of coping mechanisms. Their findings support the idea that contract farming encourages the adoption of techniques for adapting to climate change. They did, however, point to a feedback impact on CF, meaning that farmers that use more adaption techniques are more likely to receive a contract offer. CF is therefore a useful instrument for policy deliberation in the framework of adapting to climate change.

Liang *et al.* (2023) noted that smallholder farmers' income can be greatly increased by CF. According to these authors, while marketing and production-management contracts can both significantly raise farmers' income, the impact of production-management contracts is bigger. Further analysis by Liang *et al.* (2023) reveals that the size of the farm, length of training programme, and the breeding year can all have a big impact on how much farmers can make through contract farming. Additionally, they pointed out that CF can significantly raise smallholder farmers' technical productivity in agriculture. The trend towards centralising agricultural production's technical efficiency is accelerated by CF participation. Additional analysis reveals that the impacts of CF on farmers' income are somewhat mediated by the technological efficiency of agricultural production.

Paltansigh and Jena (2023) find that adopters of CF farmers were more efficient than non-CF farmers based on a data set from cross-sectional survey of 754 farmers who grow wheat, using the

endogenous switching regression method and data envelopment method. In particular, they noted that farmers who implemented CF would see a 16 percent decrease in technical inefficiency compared to those who did not. In contrast, if non-CF farmers switched to adoption, their technical efficiency would rise by 12 percent according to the study. They credited enhanced production technologies and higher-quality inputs for this CF provision. Paltansigh and Jena (2023) did observe, though, that a tiny proportion of farmers were also facing some financial difficulties, such as unpaid invoices, expensive inputs and a absence of prompt available funding. In order to include small-scale farmers into the purview of the CF system, this needs to be sufficiently addressed.

Adebisi *et al.* (2021) assessed the effect of CF on grill output in Nigeria. A multiphase sampling process was employed to choose a sample of 120 farmers, comprising both the farmers involved in CF and those that were not. Descriptive statistics, the ordinary least square regression model, and the stochastic production frontier were used to analyse the data. Because contract farmers get more money from producing broilers than their non-contract farming counterparts, the majority of farmers (75%) felt that contract farming was a good and beneficial practice. Contract farmers had an average technical efficiency (0.8209) that was greater than that of non-contract farmers (0.6803).

Brandao and Schoneveld (2021) assess labour restrictions and inclusion issues using cross-sectional data gathered from Brazilian contract farmers that grow palm oil. The outcome demonstrates how household labour and land resources significantly influence patterns of inclusion and exclusion. Additionally, the study uncovers that hiring of outside labour affects how labour time is allocated and that this hiring increases in poor land and labour households. They provide vital insights into abroad business and value chain development challenges, and they cast doubt on the practicality of labour-oriented CF eligibility principles.

Hseih and Luh (2022) employ the simulated maximum likelihood estimation of the multinomial treatment effects model to investigate economic effects of four mutually exclusive adoption decisions that smallholder rice farmers in Taiwan made regarding CF and modern marketing channels. The findings offer empirical support for higher returns from dual partnerships: CF is likely to contribute more to higher revenue generation for farmers who choose modern distributors as their primary channel of marketing than for farmers who rely on traditional channels of marketing, and CF generates more revenue for those who choose modern distributors than for those who do not. Additionally, Hseih and Luh (2022) use conditional and unconditional quantile regression models to study a distributional pattern of the marginal economic impacts of either CF or contemporary channels of marketing among farmers at different sizes. According to their findings, CF or using contemporary distributors offers rice farmers more financial advantages in exchange for higher returns, and the marginal treatment effects often exhibit an upward trend as the quantile rises.

2.11. Theoretical Framework used in smallholder agriculture Commercialisation

In this section, the study explores theories employed in agriculture commercialisation. The theories discussed include random utility theory, transaction cost theory and agricultural household model.

2.11.1 Utility theory

Utility is a measure of how satisfied people are upon consumption of a good or service. It is frequently depicted as being influenced by the consumption of different goods and services, ownership of capital (wealth), and the use of free time. Smallholders cultivate a piece of land in order to meet their physical food demands and to increase their wealth by commercialising their agricultural activities (Adeoti *et al.,* 2014). Utility functions assess farmers' preferences for wealth as well as the total risk farmers are ready to accept in the aim of acquiring higher wealth (UN, 2012). To optimise the pleasure of their labour in terms of returns, smallholder farming households decide what kind of crop(s) to grow, what quantity to produce, and where and when to market or sell the output.

Households are supposed to maximizing utility (U) by determining the quantity of commodity or service they consume, generate (q^i), purchase (b^i), and market (s^i), while considering a variety of typical constraints, including those related to money, the availability of resources, and the production function. Due to financial constraints, the overall value of household purchases must equal or be less than the money made from labour and other activities, as well as from the sale of staple or cash crops that the household grows (Wickramasinghe, 2015). This essentially removes the possibility of borrowing or lending, albeit household savings from prior seasons or years may be added to the endowment. The mathematical expression underpinning the theory of Utility maximization is as below:

$U = f(x_{1,}x_{2,} \ldots . , x_n)$

Where

U is the total utility derived from consuming goods $x_1, x_2, \ldots, x_n$.

$x_i$represents the quantity of good i

2.11.2 Transaction cost theory

According to this argument, smallholder farmers will be interested to participate keenly in the agricultural market, if transaction costs are reduced to a minimum. The transaction cost hypothesis was founded on Coase's foundational work, which distinguished between a firm and a market (Coase, 1960). Transaction costs are a major impediment to smallholder farmers' long-term engagement in commercialisation, including information gathering process, contracts negotiation, and incurring fees connected with moving goods to markets. Smallholder farmers have minimal production capacity, which means they cannot adjust production volumes quickly to suit market demands, and they cannot keep-up with cost-cutting technology improvements, making them less competitive (Kirsten *et al.*, 2012).

Karaan (2002) explained transaction costs as "the expenses of running an economic system, friction in the economic system, information defects, progressing from ignorance to omniscience, eliminating uncertainty, and carrying out trade." The literature on the new transaction cost economy emphasises unpredictability, transaction frequency, and asset specificity. According to Williamson (1979), uncertainty suggests that contracting parties have imprecise information about the current situation and the possibility that one party would engage in opportunistic behavior. As a result, calculating uncertainty is challenging. According to Bijman (2008), buyers face a dearth of data on quality of commodities, and in case of farmers, market conditions limit the profitability of transactions.

Asset specificity is the degree to which an organization's investments have a particular or restricted set of useful and profitable applications. The investment made by farmers and processors in a particular asset under a particular contract structure has little to no value when put to other purposes. Therefore, the more incentive there is to get into a contract to protect the assets, the more particular the assets are. Frequency of exchange and frequency of commerce are the same. Transaction costs are high when transaction frequency is low and vice versa. When agricultural items are transferred to processing companies, transaction costs are greater due to the coordination required in synchronising production, harvesting, collecting, and processing (Williamson, 1979). As a consequence, agreements made in contracts between farmers and processors serve to lower expenses and increase mutual agreement.

Two categories of transaction costs in CF are described by Williamson (1979). The first is the ex-ante transaction cost, which covers the cost of finding a partner for the contract, settling on terms, and creating, safeguarding, and overseeing the document. The second is the Ex-post transaction cost, which accounts for legal fees and other costs associated with resolving a disagreement in the

firm's operations and pricing. It is important to consider potential areas of reduction in per-unit costs within the production and contracting procedures (Colen *et al.,* 2013). The expenses of stricter quality control by processors and exporting companies, as well as the cost of updated food safety and quality laws required in export destination nations, are connected to the transaction costs in CF. According to Colen *et al.* (2013), there are a number of strategies for reducing transaction costs. These include, among other things, making investments in the physical infrastructure of markets, enhancing coordination between participants in the value chain to enable traders to contract larger volumes, lowering trading costs, and making transportation infrastructure investments.

As economic institutions, CF techniques can help to lower uncertainty, guarantee that businesses focus on and invest in certain assets, and increase the frequency of exchanges (Williamson, 1979). One effective way to reduce costs is through CF. CF provides a farmer with a definite marketing route and reduces uncertainty by reducing the possibility of fraud and deceit (Prowse, 2012). Reduced transaction costs are necessary for both vertical coordination and quality improvement. As a result, CF offers the business greater assurance about the amount and calibre of goods it will receive. The effect evaluation hypothesis has to be examined once the major transaction expenses related to CF have been identified. The part that follows will provide an explanation of the impact evaluation theory.

2.11.3 Agricultural household model

According to Key et al. (2000) and Renkow *et al.* (2004), the fundamental features of the agricultural household model are that farmers access to the market is not equal due to differences in transaction costs associated with market participation, and geographic markets may be equally integrated into the universal economy differentially due to differences in trade costs, the level of

competition among marketing agents, or both (Fackler and Goodwin, 2001). These characteristics lead to structural patterns of market participation that have a substantial impact on agricultural development policy and the application of various policy instruments. They also realistically tempt households to self-select out of markets, reduce the welfare and behavioural effects of price shocks. The household maximizes its utility by specifying a bundle of consumption goods which include agricultural products, $q^c$for $c = 1, \ldots \ldots C$ (where C = crops produce by farm family) and other tradable goods, x bought from the market. Sources of income for the household include sale and production of all crops or one crop and non-farm works, (w). It is assumed that production technology $f^c(A^c, G)$is specific to each crop which maps the movement of household assets including labour, land, machinery, livestock etc. denoted by vector A (private assets) and extension services, roads, standards and grades etc., denoted by vector G (public goods and services) into output. The principal function performed by institutional and physical infrastructure such as enforcement of contracts, extension services, protection by police, market information services, road, standards and grades, electricity etc. is often underappreciated in analysing market behaviour (Barrett, 2008). Farm household chooses to engage or not in each crop market as a seller, denoted by M^{cs}. M^{cs}takes the value of 1 if farmer engages in the market as seller or 0 if farmer decides not engage in the market as seller. On the contrary, farmer decision to engage in the market as buyer denoted by M^{cb} in which M^{cb} takes 1 for farmer participating in the market as a buyer and 0 if household elects not to engage in the market as a buyer. The net crop sales expressed as;

$Ns^c \equiv f^c(A^c, G) - q^c$

C = 1,…..C which is positive if and only if $M^{cs} = 1$ and negative if and only if $M^{cb} = 1$. Farmer faces a price (market price) for every crop, p^{cm}, and farmer and crop specific per unit sold transactions costs, $\tau^c(Z, A, G, w, Ns^c)$ which could be determined by public goods and services,

G, such as broadcast of radio on prices that influences costs of searching, crop marketing strategies information, road to market accessibility; farmer specific factors such as age, gender, education which may searching costs, skills in negotiating, etc., as revealed in Z, and assets of the farmer, A, off-farm earnings, w, and net sales volume. The net sales volume may influence cost of transactions when fixed cost exist such that as volume of transaction increase total per unit transactions costs decline. This might capture also nonlinear pricing in which various prices are offered by agents for output subject on the size of sales. The farmer problem is to make decision on market engagement and the scale of crops produce to maximise utility on a set of consumption goods produced as well as purchased from the market.

2. 12 Gaps identified in the literature and filled by this study

The study hopes to add to the literature and close a knowledge gap on agricultural commercialisation (i.e., market involvement) in northern Ghana among smallholder farmers. Few socio-economic studies investigated drivers of smallholder farmers' CF participation decisions and the impact of contract farming on farm performance using a staple food crop, according to the researcher's empirical literature analysis (Bidzakin *et al.*, 2019; Abdulai and Al-hassan, 2016) but none of these was on maize. Ghana's Agricultural Food Policy (FASDEP) promoted smallholder farmer output to be commercialised in order to improve livelihood and income; as a result, this remains a priority area of research for this study in order to contribute to policy interventions. The study adopted the endogenous switching regression model to predict impact of CF (commercialisation model) on farm performance using yield per acre and net returns. These metrics are mentioned in the literature as a more accurate method of determining welfare impact (Bidzakin *et al.*, 2019; Dubbert, 2019; Cipriano *et al.*, 2017; Abdulai and Al-hassan, 2016). Furthermore, there is a scarcity of empirical studies on the welfare impact of intervention projects

like CF in in support of smallholder agriculture. The significance of CF in improving productivity of crops and income among smaller farm households was considered in the study, and thus a comprehensive analysis of this model and nature of smallholder agricultural commercialisation was worthwhile for policy decisions on smallholder welfare in farming in northern Ghana.

Also, prior study has mostly focused on the elements that govern the quantities, procedures, and consequences of agricultural commercialisation on employment, profitability, income, and nutrition (Hailua *et al.*, 2015; Mitiku, 2014; Okezie *et al.*, 2012; von Braun, 1995) leaving the smallholders decision to commercialise. The DHM was adopted to predict farm and household factors that influence smallholder commercialisation (market participation). When using cross-sectional data to analyse market participation, other researchers have employed models such as Tobit, Ordinary Least Squares, and the Heckman two-stage model, which are poor at controlling for selection bias. This study considered exogenous elements that influence the decisions of farmers to join in the market and their level of participation. According to the study, market failure owing to bad nature of road network and limited access to market may discourage small-scale farmers from pursuing agricultural commercialisation, which may have a detrimental impact in reducing poverty and improving income among smallholder farmers. Furthermore, the majority of commercialisation literature focuses solely on the output side of commercialisation. However, integration into input markets is also required for sustainable smallholder commercialisation (Pingali and Rosegrant, 1995). In order to address a vacuum in the commercialisation literature about household participation in the market for crop inputs, the researcher also studies the ratio of the value of purchased inputs used to the total inputs value. Furthermore, no study has been done to uncover the best commercialisation strategy to employ in Ghana, particularly northern Ghana. Finally, the study found that, while CF as a commercialisation model increases smallholder

productivity, it has an effect on their desire to engage in output market of maize and has a positive effect on the proportion of maize output sent to the market for sale. This underlines the gaps and constraints of adopting contract farming as a model to commercialize smallholder farming, as well as the policy effort in northern Ghana to reduce poverty and improve smallholder income. As a result, this study objective was to bridge these gaps by providing empirical data that will help Ghanaian policymakers determine the optimal course of action for smallholder commercialisation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the approaches used to accomplish the study objectives. The ecological description of the research area is included in the first section. Section two discusses the sampling strategies and contains information on how the sample size was determined, as well as sampling methods used, sources and types of data that were gathered. Section three of this chapter provides a description of the data gathering methodology while section four looks at the conceptual framework. This chapter concludes with an explanation of the empirical econometric models used to analyse each of the objectives.

3.1 The study area

Northern Ghana (Savanna, Northern, Northeast, Upper West and Upper East regions) is positioned between latitudes 8°N and 11°N and longitudes 2.5°W and 0.5°E (Figure 3.1). Northern Ghana is located in the country's north and is made up of Sudan and Guinea savannah. Northern Ghana's agro-ecological zones have unimodal rainfall, allowing for only one agricultural season, as opposed to the southern half, which has a bimodal rainfall season. The harmattan period, which begins in December and ends in March, defines the solitary growing season in the north. High temperatures of between 32 °C and 38 °C are present in the area (Ghana Meteorological Agency-GMet, 2023). Farming, primarily at the subsistence level, is the area's principal economic activity (GSS, 2019). The area is well-known for the growth of food crops, which contributes extensively to the country's food needs. Maize, rice, sorghum, yam, Bambara groundnut, millet, groundnut, beans, and soybeans are among the principal crops farmed in the area (MoFA, 2021). The northern

areas are considered the poorest and least developed of the country's sixteen regions, making commercialisation research, such as this one, extremely significant in the area.

Among crops grown in the area, the maize crop predominates, with about 72 percent of farmers cultivating maize (GSS, 2021). The average land holding per household ranges from 1 to 4ha, while farm holdings of up to 15ha have been documented for a few well-off households growing crops such as maize, rice, and yam (Sugri *et al.*, 2017). Cotton and sheanuts, as well as rice, maize, sorghum, millet, and yam, are key industrial crops in the zone. Northern Ghana is also a livestock farming zone where livestock such as sheep, goats, cattle and poultry are kept under varying farming systems.

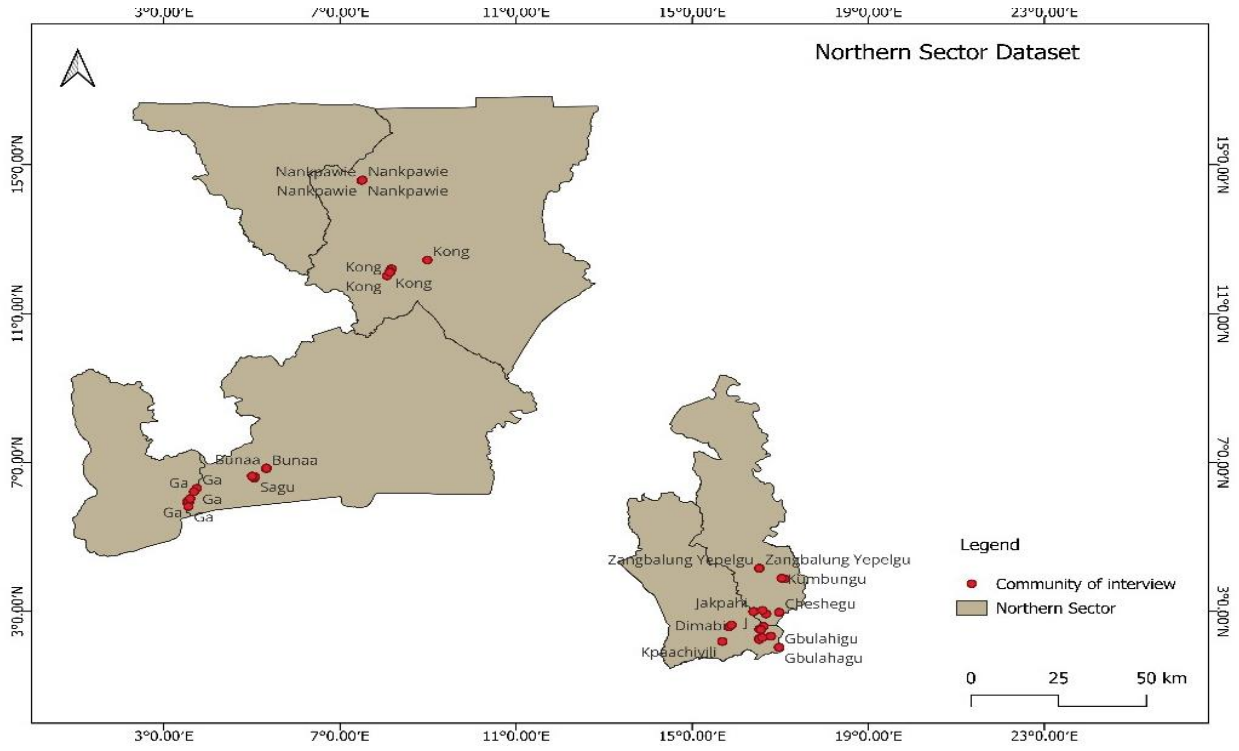

Figure 3.1: Map showing the study area

Many smallholders in this area have benefited from agriculture related development initiatives including PFJ, GCAP among others intended at intensifying production and bettering livelihoods. However, smallholders in these locations continue to face numerous production and market hurdles. Because of a limited access to the agricultural output market, smallholders in many

farming areas are obliged to market farm products at lower rates. The existence of a sizable number of private sector players such as RMG Ghana, Modab Enterprise, GAB Venture, Agromite among others is another advantage for northern Ghana. Smallholder farmers in the study regions mostly grow maize for their own consumption and engage in CF for maize production.

3.2 Sampling Strategy

3.2.1 Sample size

One of the fundamental difficulties in sampling is defining the sample that rightly represents the population. Yamane (1967) technique was used to sample 420 maize producing households. Except for agricultural farm households, no information on the population of maize farming households is available. However, there is data available on the number of agricultural households that own or operated a farm.

To determine the sample size for the study, the proportion of households in northern Ghana that cultivate crops is used as the sample frame. This approach is justified by the fact that all crop-cultivating households in the Northern Ghana also cultivate maize. According to the Ghana Living Standards Survey (GLSS7) main report, the northern region has 479,675 households, of which about 70.6 percent are crop farming households. The Upper East region has 226,983 estimated households, of which about 83.2 percent are crop farming households, while the Upper West region has 162,655 households, with 80.4 percent being crop farming households (GSS, 2019). Based on these percentages, the Upper West, Upper East and northern, regions have 130,775, 188,850, and 338,651, crop farming households, respectively. Adding these up yields a total of 658,276 crop farming households in northern Ghana. Using this as the sampling frame, the study applied Yamane's (1967) approach to calculate the needed sample size. This process is mathematically represented as follows;

$$n = \frac{N}{1+Ne^2} \qquad 3.0$$

where, N is the size of the population, e is the percentage of allowable imprecision, which is set at 5 percent, and n is the required sample size.

$$n = \frac{658276}{1+658276(0.05\times0.05)}$$

$$n = \frac{658276}{1647} = 399.7 = 400$$

3.2.2 Sampling procedure

The study area, which is northern Ghana was pre-defined due to the predominance of government and other international donors have invested significantly to commercialise agriculture and improve smallholder farmer inclusion in modern agricultural value chains. CF arrangements therefore abound in the area. To choose regions, districts, enumeration villages, and farm households for interviews, a multistage sampling process was used. After scoping and clustering the area, Upper West and northern regions were chosen from the five regions of northern Ghana based on maize production and maize contract farming operations. The scoping was required to determine the level of maize production and agricultural contract activities in northern Ghana.

Five districts with intensive maize production and maize CF activities were purposively chosen for the second step of the sampling method. The districts include Wa East, Wa West, and Sisaala East in the Upper West area, and Tolon and Kumbungu in the Northern region. To eliminate selection bias and the potential spillover effect of the maize CF programme, non-CF farmers were chosen in maize non-contracted farming districts. Because of the considerable operations of maize CF in these districts, the Sisaala East and Wa East districts were chosen as CF districts. The districts of Wa West, Tolon, and Kumbungu serve as the control groups. Spillover effects may

occur if non-contract households gain access to contracting firm technologies through a visit to a contract farm household.

The next step was to choose five enumeration villages using simple random from each district. This was accomplished through the use of a sampling frame given by district MoFA offices in the study zones. A total of 25 enumeration villages were chosen at random from the five districts. The final step in the sample technique was to select farm households for interviews. In each enumeration village, a list of farm households that cultivated maize during the 2019 cropping season was compiled with the assistance of MoFA field extension officers and lead farmers. A proportionate sampling technique was employed to determine the number of households selected from each enumeration area, ensuring representation based on the relative size of the maize farming population. Consequently, 15 to 20 farm households were randomly selected from each enumeration area using a simple random sampling approach. As a result, a total of 420 maize farm households from the study zone were visited for the study, including 169 contract households and 251 non-contract households.

3.3 Type of Data and data collection method

The study relied on primary data from maize farm households between July and October 2020, using formal and informal interviews as the data gathering techniques. Semi-structured questionnaire was used for the data collection. Both open-ended and closed-ended questions were included in the questionnaire, allowing for the collection of both quantitative and qualitative data. The open-ended questions allowed farmers to provide an in-depth response without being restricted by pre-determined responses. The close-ended questions on the other hand provided a scope of responses and response options farmers were expected to give. In addition to the semi-

structured questionnaire, a checklist for key informant interviews and focus group discussions was developed and used for data collection.

The use of a semi-structured questionnaire allows for information triangulation on both close and open ended questions. In order to capture data pertinent to the topic of inquiry, the questionnaire included a variety of areas related to the study's aims, including demographics and farm characteristics, crop production, crop marketing, farm revenue, and CF arrangements. To aid in data gathering, the researcher recruited research assistants with extensive experience in both qualitative and quantitative data collection, as well as fluency in the local languages.

To correct for inconsistencies in questioning, the questionnaire was pre-tested. The pre-test responses aided in identifying difficult and ambiguous questions. Questions that were discovered to be particularly ambiguous were changed. The pre-testing also necessitates the elimination or addition of questions that improve the questionnaire's validity and reliability. The qualitative data gathered was classified and categorized according to the study's topics before being presented in narrative style with descriptive quotations.

3.4. Conceptual framework

In smallholder subsistence agriculture, commercialisation occurs when farm households produce marketable surplus of food crops over the consumption needs of the subsistence family. Figure 3.2 illustrates the conceptual framework of this study. To generate marketable surplus, farm households needs to first increase output of food crop or grow cash crop. This may be achieved through adoption of new practices and inputs or through utilisation of greater available household labour with the same production function or with improve technology involving product variety or production technique (Ayenew *et al.*, 2020). Household marketed surplus is affected by their food and cash crop production and the food consumption needs of the household. When household

food crop production is greater than their food consumption needs, a marketable surplus is generated which affect a farmer's decision and level of involvement in the market.

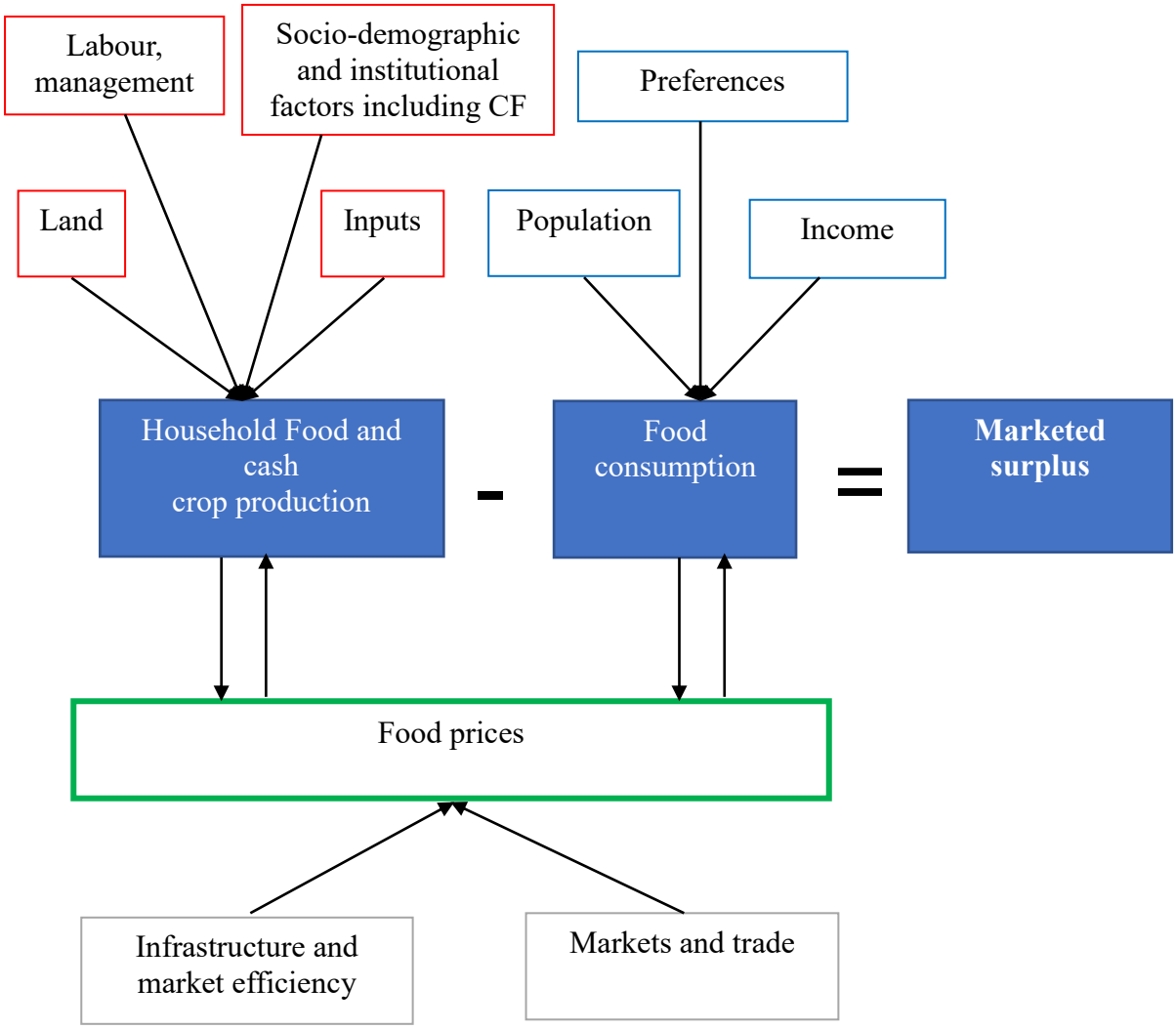

Figure 3.2: Conceptual framework
Source: Author's construct

However, food crop and cash crop production are affected by farmer, farm-specific and institutional characteristics including CF. For instance, land is essential for agricultural production, therefore its availability and quality determine productivity levels. The efficiency and skill of farm labour and management practices influence production outcomes. Production inputs such as seeds,

fertilisers, pesticides, and machinery that enhance productivity have a significant yield effect in agricultural production. Regardless of this, smallholder farmers are confronted with high input costs resulting in poor adoption of improved technologies. Sustainable agricultural growth necessitates increased input utilisation, particularly of contemporary inputs such as fertilisers, seed, agro-chemicals, pesticides, irrigation and machinery that integrate improved technology (Sheahan *et al.*, 2017). Engagement in CF determines access to structured markets and support systems. CF is expected to assist poor smallholder farmers to acquire yield-improving inputs and assist in market access. CF farmers receive inputs and financial support, increasing productivity and lowering barriers to market entry. The notion is that CF supports smallholder farmers to improve input and technology utilisation. The outcome is increased productivity and generation of more marketable surplus which may change the production patterns of the smallholder farmers. CF also provides guaranteed markets, reducing risks of price fluctuations and ensuring steady demand. CF farmers produce high-quality goods that meet commercial and export market standards. Price agreements in CF stabilize incomes, encourage investment in production, and reduce vulnerability to market shocks.

Aside from the agricultural inputs, household variables such as education, sex, age, and experience influence yield and the creation of marketable surplus. Once these objectives are met, productivity changes. Production, revenue and marketable surplus are further influenced by the structure of the output market, distance to both output and input markets, infrastructure, and relationships with extension service providers.

Changes in agricultural product pricing and agricultural input consumption may have an indirect impact on consumer welfare and economic growth. Food crops prices influence both consumption and production patterns. For instance, at low prices, production of food crops will be low while

consumption will be high and this affects marketed surplus that will be produced. At higher food prices, food production will increase which, generally increases marketable surplus. Food prices are also affected by infrastructure and efficiency in markets. Lack of infrastructure prevents increased production capacity from participating in profitable markets. In instances where farmers successfully became market oriented in their production, they are unable to take advantage of high price market due to bad road infrastructure between remote production areas and market centres. Infrastructural improvement lessens transaction costs and accordingly facilitate smallholder households to obtain good prices in the market (Kirsten, *et al.,* 2012).

The lack of suitable transport services, bad road networks and weak communication system are associated with marketable surplus negatively because of high cost in transaction as the small-scale producers are unable to stock the market with their produce (Asfaw *et al.,* 2010). Infrastructural improvement and efficiency in the market affect households' level of market involvement by reducing cost of transaction (Thakur *et al.,* 2023; Mgale and Yunxian, 2020). Lack of market information and market for crop produce, high cost of inputs and a decline in output prices present bottlenecks to crop commercialisation as agricultural productivity is impacted by these factors. The production of food crops is affected by many factors including land, labour and inputs. Also, socio-demographic and institutional characteristics like education, family size, sex, farmer-based-group, access to extension services, CF among other affect household crop production.

3.5 Analytical Framework

To achieve the specified objectives of this study, it is imperative to establish the analytical frameworks. Initially, a descriptive analytical approach was used to provide a broad explanation of the design and operationalisation of CF schemes in northern Ghana. In addition, this study

examined the application of the Endogenous Switching Regression (ESR) model to explain the factors affecting engagement in CF and to quantitatively assess the effect of CF on maize farm yield and maize net farm revenue. Furthermore, the study explored the use of the Cragg's double-hurdle model as a means to elucidate the factors affecting both decisions to participate and the degree of engaging in the output market, commonly referred to as commercialisation. Finally, this study delved into the application of the endogenous treatment effect model, specifically in relation to fractional outcomes, to estimate the effect of CF on the commercialisation of maize (household commercialisation index). The ensuing sections provide an explanation for each of the analytical approaches.

3.5.1 Design and Operationalization of CF arrangements in northern Ghana

The first objective was investigated using a qualitative content analysis approach, which allowed for a systematic examination of textual data. This approach was used to categorize and rationally compute data into predetermined groups, certifying that the data was effectively summarized, tabulated, and organized into quantifiable groups. Explicitly, the data was grouped into verbal and behavioural groupings, allowing for the detection of important trends and themes associated to CF arrangements in Northern Ghana.

To ensure reliability and validity of data, power analysis was performed to decide the appropriate sample size for data gathering. Power analysis aids in determining the minimum number of observations required to notice significant effects statistically, while minimizing Type I and Type II errors. Given that the objective of the study is to compare maize farm households under CF with those not under CF, an effect size estimation was considered based on preliminary field data and prior research. The statistical power was set at 80% (0.80) with a significance level (α) of 0.05, ensuring sufficient robustness to identify expressive variations between CF and non-CF groups.

Subsequent to the data collection, qualitative information was divided further into minor and major themes via constant reviews of transcribed focus group discussions (FGDs)and interviews. Key informant data was not merely summarized, categorized, or tabulated but analyzed with the intent of preserving live meanings and expressions from respondents (Cipriano *et al.*, 2017). The thematic analysis process involved:

Transcription and Translation: Unpackaged speeches from key informant interviews and FGDs was transcribed verbatim and translated where necessary.

Data Coding and Categorization: The transcribed data was organized using grouping techniques, where patterns or themes such as behaviours, concepts thoughts and interactions were identified.

Validation and Refinement: Groups were reviewed to ensure coherence and avoid redundancy of concepts describing the complete dataset.

The quantitative data also generated by transforming the qualitative findings into measurable variables, followed by statistical analysis. The data was moved into a computer after transcription and thematic coding, for further coding, labelling, and quantification before being analysed using SPSS and later imported into STATA for advanced statistical testing. The analysis included:

*Descriptive Statistics***:** Used to summarize demographic and farm characteristics.

Non-Parametric Tests (Chi-Square & T-tests): These tests were employed to compare differences between farmers under contract and those not participating in contract farming.

Furthermore, the study employed content analysis involving the calculation of word frequencies, phrase occurrences, and thematic patterns, ensuring that conclusions were drawn based on data-

driven insights (Hancock *et al.*, 2001). This methodological approach ensured that CF arrangements is holistically assessed of, ensuring that the study captured both the qualitative and quantitative proportions of smallholder maize farmers' experiences.

3.5.2 Impact of contract farming on farm performance

It would be biased and oversimplified to assume that differences in crop yield and net farm revenue of CF and non-CF farmers are the result of contract farming when analysing project impact, such as the effect of CF on smallholder crop yield and net farm income. When experimental data are used and the counterfactual problem is known, as Tufa *et al.* (2019) pointed out, the issue of causal inference is not a concern. Causal inference is a fundamental issue with cross-sectional data where the counterfactual condition is unknown (Bidzakin *et al.*, 2023; Bidzakin *et al.*, 2019).

The farm household decision to participate in CF is modeled under the assumption that household decide to join CF and benefit from participation over not participating in CF and forgo the benefits. Households' decisions to join CF, on the contrary, may be endogenous due to self-selection into the CF arrangement based on observable and unobservable features. Endogeneity arises when an explanatory variable of interest (in this case, CF) is correlated with the error term of the regression model, resulting in inconsistent and biased estimates. If this is not corrected, the impacts of CF on agricultural performance will be skewed.

The problem of endogeneity in impact evaluation analysis using observational data has been addressed in literature with two widely used econometric techniques: propensity score matching (which uses propensity score techniques) and endogenous switching regression (ESR) (which uses instrumental variable technique). Propensity score estimate aims to attain equilibrium in the observed variable distribution between the groups of persons receiving treatment (CF farmers in this example) and those receiving no treatment (non-CF farmers). While propensity score matching

(PSM) technique is a valuable econometric, it has some limitations. PSM is strongly reliant on the correctness of calculated propensity scores. If the propensity model is incorrectly constructed, the matching process may fail to appropriately balance variables across groups, which may lead to biased estimates. In addition, PSM is built on the assumption that all relevant confounding variables are detected and incorporated in the propensity model, hence; confounders that are hidden or unmeasured might nevertheless skew the outcomes (Ali *et al.*, 2020). In contrast, endogeneity is explicitly modelled in ESR by taking into account the possibility of self-selection into treatment groups based on unobserved or unmeasured features. Moreover, ESR acknowledges the potential existence of latent variables that could affect both outcome and treatment variables. By employing the ESR approach, the selection process can be more effectively managed, allowing for improved control over unobservable variables that may not be explicitly addressed by PSM. Nevertheless, it is crucial to acknowledge that ESR does possess certain limitations, such as the possibility of model misspecification and the necessity for certain data requirements. In order to explicitly account for endogeneity and address the issue of hidden biases that might affect the estimates, this research adopted the ESR to quantitatively estimate the effect of CF on farm performance.

Several studies have used the ESR to evaluate the effects of technology adoption including CF adoption in agriculture on countless outcomes such as gross margin, yield, household expenditure and farm income (Bidzakin *et al.*, 2019; Abdoulaye, *et al.*, 2018; Wossen *et al.*, 2017; Abdulai and Huffman, 2014). Using full information maximum likelihood to account for endogeneity, ESR predicts a simultaneous equations model with endogenous switching (Lokshin and Sajaia, 2004). Despite the fact that ESR is based on normalcy assumptions, it is more efficient than instrumental variable procedures. The ESR has the benefit of differentiating factors impacting outcomes

between the treated and control groups and controlling for factors that affect the treatment itself (CF). The ESR corrects for structural variations in outcome functions between CF and non-CF farmers in addition to selection bias (Tufa *et al.*, 2019; Seng, 2016). Since smallholder farmers are free to decide whether or not to take part in CF, the following advantages are evident:

$$D_i^* = \gamma' Z_i + \varepsilon_i, D_i = 1[D_I^* > 0] \quad 3.1$$

D_i is a binary variable that equals 1 for farmers who participate in contract farming and 0 for those who do not. γ denotes a vector of to-be-estimated parameters. The error term includes measurement errors as well as unknown factors, and it has a zero mean and constant variance, σ_ε^2. Factors influencing contract farming decisions are included in Z (i.e. household, farm-level and institutional characteristics). Because smallholders' qualities vary, not all of them will participate in CF. Those who participate can expect a larger yield as a result of their participation.

Regime 1 $Y_{ic} = X'\beta_{ic} + u_{ic}$ if $D_i = 1$ 3.2

Regime 2 $Y_{in} = X'\beta_{in} + u_{in}$ if $D_i = 0$ 3.3

where the outcome from CF and non-CF are Y_{ic} and Y_{in} respectively, X' is vector of variables like farmer characteristics and institutional elements. β are parameters to be estimated. Even though the variables in *Z* and *X* in equations (3.1), (3.2) and (3.3) may overlap, it is essential to note that correct identification demands that one variable in *Z* is excluded from *X* (Abdulai and Huffman, 2014).

The participation equation's error terms and the outcome equation's error terms may have non-zero covariance as a result of self-selection into CF. It is assumed that the error terms ε, u_c, u_n have a trivariate normal distribution with a zero mean vector and the subsequent covariance matrix:

$$cov\ (\varepsilon, u_c, u_n) \begin{bmatrix} \sigma_c^2 & \sigma_{cn} & \sigma_{c\varepsilon} \\ \sigma_{cn} & \sigma_n^2 & \sigma_{n\varepsilon} \\ \sigma_{c\varepsilon} & \sigma_{n\varepsilon} & \sigma_\varepsilon^2 \end{bmatrix} \quad 3.4$$

where var(u_c) = σ_c^2, var(u_n) = σ_n^2, var(ε) = σ_ε^2, cov(u_c, u_n) = σ_{cn}, cov(ε, u_c) = $\sigma_{c\varepsilon}$ and cov (u_n, ε) = $\sigma_{n\varepsilon}$. For this reason, the error term in equation (3.2), conditional on the sample selection criterion, have non-zero expected values, and OLS estimates of coefficients $\beta_c$and β_n suffer from sample selection bias (Lee 1982).

There are two steps involved in the model estimating process. In order to estimate γ in equation (3.1) and ascertain the chance of participating in CF, the first step entails a probit regression. This two-step method shortcoming is that it produces heteroskedastic residuals, which means that consistent standard errors cannot be obtained without laborious corrections (Lokshin and Sajaia 2004). This issue is resolved by simultaneously estimating the participation equation and the outcome equation in Lokshin and Sajaia's (2004) full information maximum likelihood technique. The study is particularly interested in the significance levels and signs of the correlation coefficients (ρ) from the estimations. As specified hitherto, they showed the correlations of the error terms of the participation equation and outcome equation (corr(ε, u) = ρ). Specifically, there is endogenous switching, if either $\rho_{c\varepsilon}(\sigma_{c\varepsilon}/\sigma_c\sigma_\varepsilon)$ or $\rho_{n\varepsilon}(\sigma_{n\varepsilon}/\sigma_c\sigma_\varepsilon)$ differ significantly from zero, which could lead to selection bias. If $\rho > 0$, this means negative selection bias, suggesting farmers whose yield are below average are likely to join in CF. Similarly, $\rho < 0$ indicates positive selection bias, signifying farmers with yields above average are also likely to join CF.

Of much interest in this research is the effect of CF on maize yield and net farm revenue. This could be analysed by first stating the projected values of the outcome (Tufa *et al.*, 2019). For a CF farmer with traits *X* and *Z*, the expected outcome value, Yic, is as follows:

$$E(Y_{ic}|D = 1) = X\beta_{ic} - \sigma_{c\varepsilon}\lambda_c \qquad 3.5$$

The previous phrase considers sample selection, showing that unobservable variables might cause farmers who have participated in CF to behave differently from an ordinary farmer with the same

attributes (Maddala 1986). Now, the farmer's expected worth if they hadn't taken part in CF is stated as follows:

$$E(Y_{in}|D = 1) = X\beta_{in} - \sigma_{n\varepsilon}\lambda_c \quad 3.6$$

The variation in outcome due to CF could then be stated as the variation between CF farmers and non-CF farmers. Therefore, the estimated values from equations (3.5) and (3.6) are used to get unbiased estimates of CF impact. These (estimates) according to Lokshin and Sajaia (2004) are the average treatment effect on the treated (ATT). Thus:

$$ATT = E[Y_{ic}|D = 1] - E[Y_{in}|D = 1] = X(\beta_{ic} - \beta_{in}) + (\sigma_{c\varepsilon} - \sigma_{n\varepsilon})\lambda_c \quad 3.7$$

where λ is the inverse mills ratios and σ denotes the covariance of the error components. It is noteworthy that if self-selection is predicated on comparative advantage, then $\sigma_{c\varepsilon} - \sigma_{n\varepsilon}$ would be positive, suggesting that adoption would provide larger yield than in the case of random assignment (Maddala 1986).

3.5.3 Selection of an instrument

Smallholder farmers in the research area make a decision to join maize CF based on subjective net returns established on experiences and intrinsic qualities. This could be due to unobserved innate traits like farming abilities, risk preferences, or motivation. Because the covariance between the error terms and CF participation decision in Equations 3.2 and 3.3 will not be equal to zero, these features are likely to influence the decision to join CF and farmers' yield and net farm revenue at the same time, posing a potential endogeneity problem. As a result, causal identification of CF participation necessitates the use of an instrument that is highly linked with the decision to join CF but has no direct effect on the outcomes (yield and farm income).

It is important that the explanatory variables in the selection equation of ERS model also include one selection instrument at least in addition to the variables that are automatically produced by the

nonlinearity of the selection model of CF participation for equations 3.4 and 3.5 to be identified (Kassie *et al.,* 2018; Di Falco, 2014; Abdulai and Huffman, 2014). Therefore, nature of road leading to the major market was employed as a variable to satisfy this exclusion requirement. Smallholder farmers particularly in the study area often purchase farm inputs or sell their products through a contract arrangement or from the community main market (Khonje et al., 2018). Maize farmers are likely to join CF when there is good road network. CF firms will be more likely to engage farming communities with better road network to reduce time and money in locating farmers. A better road network improves access to farmers and aggregation of output at a lower cost. The variable measures the easiness of movement between the farmer locations to the nearest major market in the research area. The assumption is that it creates opportunity for the farmers to join CF but does not directly influence yield and income.

To confirm the instrument's validity, a falsification test was also conducted following the approach outline by Di Falco *et al.* (2011). This test was employed to assess whether the instrument effectively measures what it is intended to measure and to rule out the possibility of spurious relationships. By testing the instrument on variables that should theoretically have no causal relationship with the dependent variable, the falsification test helps confirm the robustness and reliability of the findings. The findings showed that the chosen instrumental variable (road network's type) for outcome variables was statistically significant in the participation equations (mean p-value = 0.0000) but statistically insignificant in the outcome equation (mean p-value = 0.7157). Given that the chosen variable affects CF participation but not farm performance, this suggests that it is a dependable tool. Similar variable has been employed as instruments in numerous empirical investigations (Khonje *et al.,* 2018, McArthur and McCord, 2017). Table 3.1 below presents the explanatory variables employed in the ESR model.

Table 3.1: *A priori* expectations for the independent variables used in the ESR model

Variable	Description	Sign on contract participation	Sign on crop yield/net returns
Sex	Sex of farmer (female = 0, male = 1)	+	+
Age	Age of farmer (continuous)	+/-	+/-
Education	Education (measured in years spent in school)	+	+
Size of the household	The number of people in farmers household	+	+
Dependent	The number of people living in the household as dependent	+	+
Land size	Total farm size in acres	+	+
Experience	Experience in maize farming (measured in years of farming maize)	+/-	+
Contact with extension	Contact with extension agents (1 = received contact, 0 = otherwise)	+	+
Farmer group	Membership to farmer association	+	+
Household labour	The total number of man-days household members worked on the maize farm.	-	+/-
Hired labour	The total number of man-days a farmer hire labour on the maize farm.	+	+
Access to market information	1 = access to market information, 0 = otherwise	-	+
Mobile phone owner	Mobile phone ownership (1 = owned mobile phone, 0 = otherwise)	-	+
Government project	1 = if farmer participated in government project implemented in the area, 0 otherwise	-	+
Access to input market	1 = access to input market information, 0 = otherwise	-	+
Market distance	Distance to the nearest major market in km	+/-	-
Means of transport	1= availability of transport, 0 = otherwise	-	+
Location	Region of farmer where the maize farm is located (1 Upper West Region and 0 Northern Region)	+	+/-
Nature of road	Nature of road network (1= tarred road, 0 = untarred road	+/-	

Note: *The variable nature of road was not used in the outcome equation because it was used as an instrument in the selection equation.*

3.5.4 Household Commercialisation (Household Commercialisation Index)

The process of gradually moving from semi-subsistence farming to production primarily for the market (Poulton and Chinsinga, 2018); altering the patterns of land use to high-value crops from low-value crops (Fredriksson *et al.,* 2017; Poulton, 2017); and becoming more and more reliant

on market for production inputs including labour (Shonhe et al., 2022; Hakizimana et al., 2017) is generally referred to as agricultural commercialisation. Additionally, as households sell a greater amount of produce in response to market signals, food crops are becoming more commercialised (Jaleta *et al.,* 2009). In accordance with this description, the most widely applied metric is the Household Commercialisation Index (HCI), which is calculated as the ratio of the total crop production value to the total crop sales value (Endalew *et al.,* 2020; Carletto *et al.,* 2017). The index measures the gross ratio of crop sold to the gross value of total crops produce in a year express as a percentage. A Household Commercialisation Index (HCI) ranging from 0 to 100 was calculated (Ogutu *et al.,* 2020; Poulton, 2017; Leavy and Poulton 2007; Von Braun and Kennedy 1994). Mathematically, the HCI is expressed as follows:

$$Household\ Commercialisation\ Index\ (HCI) = \frac{Gross\ value\ of\ crops\ sold}{Gross\ value\ of\ all\ crops\ produce} \times 100 \qquad 3.8$$

This measure the degree to which farmer's crop production is focus towards the market. Zero value infers a complete subsistence-focus farmer and a value of 100 means complete commercialization. According to the work by FAO (1989), households with HCI < 25% are subsistence oriented, between 25%≤ HCI <50% are transitional (semi-commercial) households and those with HCI ≥50% are commercially oriented. To perform casual analysis, the commercialisation index was used to perform an econometric analysis to evaluate factors affecting the smallholders' decision to engage in the market and the degree of participation in the exchange market.

3.5.4.1 Analytical approach to smallholders' market participation

Adoption demand functions within the framework of the agricultural household model, where the household is often viewed as both a producer and a consumer, may be used to represent smallholder involvement in the market. Numerous farm and socioeconomic factors influence

smallholder farmers' decisions to participate in the market (Haile *et al.*, 2022; Endalew *et al.*, 2020; Dangia *et al.*, 2019). The utility maximisation theory was theoretically used to examine the data for this study. The foundation of this theory is the idea that smallholder farmers choose their actions based on what would maximise their own utility. This means that smallholder farmers must choose the option that provide them with the most utility when presented with options, such as whether to engage in the market or not. Thus, the utility function's mathematical formulation is shown below:

$$U_i^* = X_i^{\cdot}\delta + \varepsilon_i \qquad 3.9$$

Where the expected utility of i^{th} farmer is U_i^*, $X_i^{\cdot}$ is a vector of farmer i^{th} attributes, the vector of parameter estimates is represented by δ, and ε_i is an error term. Farmer i decide to involve in the market only if $U_{i1} > U_{i0}$, where U_{i1} is the utility for deciding to participate in the market, and U_{i0} is the utility for deciding not to participate. Subject to expectations of individual farmers toward the utility for participating in the market and based on the individual farmer attributes, a farmer decides on the level of participation.

This section of the study examined the impact of CF on farmers' likelihood of participating in the maize market. The decision to participate is influenced by unobserved factors such as risk attitudes and ambition, which might also correlate with variables like CF participation. Farmers engaged in CF may achieve higher output, thus enhancing their market participation. This study assumes that CF participation is non-random and employs the control function approach to address this. This approach requires an instrumental variable (IV) that is correlated with the potentially endogenous variable (CF participation) but uncorrelated with the error term in the structural model, once other covariates are considered. Therefore, awareness of CF or prior experience with CF serves as the

instrument in the reduced form equation, which is then excluded from the structural market participation equation. Farmers' awareness or prior experience with CF likely influences their decision to participate in CF. After accounting for other covariates, CF participation is unlikely to be directly correlated with the error term in the market participation equation, except through the reduced form equation, thus satisfying the exogeneity assumption.

A residual from the first stage Probit estimation is included in both the first and second stages of the market participation analysis, addressing the endogeneity of CF participation. This approach helps to control for endogeneity issues when estimating market participation. Another challenge in analysing market participation is the distinction between the decision to participate in the market and the extent of participation. Many farmers do not participate, resulting in a significant number of zero outcomes in the dependent variable. Functional forms that accommodate this non-linearity include the double hurdle and Type 1 Tobit models (Tabe- Ojong *et al.,* 2021; Tafesse and Korneliussen, 2021; Dlamini and Huang, 2019; Donkor *et al.,* 2018). The double hurdle model is more flexible, assuming different decision processes for the two hurdles (participation and extent of participation), while the Type 1 Tobit model is more restrictive, assuming both decisions are driven by the same process and giving less emphasis to the initial participation decision.

In this research, I used the Cragg's Double hurdle model (Schmidt *et al.,* 2020; Ingabire *et al.,* 2017) as a more flexible and alternative method to the Tobit model. This alternative two-stage model is relevant to our study since it is based on the notion that smallholders' decisions to participate are influenced by different independent vectors. A less stringent variation of the Heckman model, the double hurdle model, works well with data obtained using random probabilistic sampling techniques (Dlamini and Huang, 2019). For this reason, the data from my randomly selected sample was analysed using the double hurdle estimation technique.

To address the issue of several zeros in the data and as a substitute for the Tobit model, the DHM was presented. The farmer must first determine whether to engage in the crop selling process and, if so, how much crops to sell. This is a two-step decision-making procedure. The Probit regression model was used in the first phase to determine the factors that influence a decision to enter the market. The decision of the farmer to engage in the market or not is represented by the model using the values 1 and 0. The DHM presents an efficient approach to demonstrating the pattern of smallholder food crop market participation. According to the DHM, before smallholder farmers can be seen to be positively engaging in the market, they must first overcome two obstacles. The decision to enter the market as a seller constitutes the first obstacle, and deciding the degree of engagement following the decision to enter is the second. Mathematically, the DHM can be stated as below:

$y_{i1}^{*} = w_i\alpha + u_i$ (Participation decision) 3.10

$y_{i2}^{*} = x_i\beta + v_i$ (Degree of participation, i.e HCI) 3.11

$y_i = x_i\beta + v_i$ if $y_{i1}^{*} > 0$ and $y_{i2}^{*} > 0$ 3.12

$y_i = 0$ or otherwise

where $y_{i1}^{*}$is a latent variable (i.e. endogenous) indicating the decision of smallholder to engage in the market, $y_{i2}^{*}$is a latent variable (i.e. endogenous) expressing the smallholder degree of market involvement, y_i is the observed degree of participation (dependent variable), $w_i$is a set of smallholder characteristics which explain the smallholder market involvement decision, $x_i$are variables which explain the degree of the market participation. $u_i$and v_i are the error terms which are homoscedastic, distributed normally and independent.

The stochastic specification can be express assuming that the error terms are independent as

$$\begin{pmatrix}\mu_i\\ v_i\end{pmatrix} \acute{N}\left[\begin{pmatrix}0\\0\end{pmatrix},\begin{pmatrix}1 & 0\\0 & \sigma^2\end{pmatrix}\right] \quad 3.13$$

In estimating the DHM, the maximum likelihood approach was used which is specified as follows,

$$LL_{double\ hurdle} = \sum_0 \ln\left[1-\Phi(w_i\alpha)\,\Phi\left(\frac{x_i\beta}{\sigma_i}\right)\right] + \sum_+ ln\left[\Phi(w_i\alpha)\frac{1}{\sigma_i}\emptyset\left(\frac{y_i-x_i\beta}{\sigma_i}\right)\right] \quad 3.14$$

Where: Φ symbolises standard normal probability, $\emptyset$ denotes density function; w_i and $x_i$are the predictor variables respectively for the probit model and the truncated model, β and α are the parameters that would be estimated.

3.6 Definition of variables

The variables in the model were selected using economic theory, prior research in this area, and useful information gleaned from field observations. In the past, models of market involvement have considered factors such as family income, resource endowment, market and road accessibility, Siziba *et al.,* 2011; Berhanu and Moti 2010; Omiti *et al.,* 2009; Kelifa et *al.,* 2021; Tadele *et al.,* 2017; Shewaye *et al.,* 2016; Tura *et al.,* 2016).

3.6. 1 Dependent variables

i. Market participation

Market participation and the household crop commercialisation index of farmers are the dependent variables for the DHM. Market participation is decided by the farmer's decision to grow maize to sell from the previous cropping season's yield. The DHM with Probit regression is used to estimate the farmer's market participation choice, which measures factors that affect the farmer's market engagement decision.

ii. Intensity of market participation

Following the farmer's declaration of intent to produce maize for sale, the HCI determines the intensity (percentage) that is sold in the market; thus, the percentage ratio of the gross value of the output sold to the gross value of the whole output gathered. In the second stage, this is computed using a reduced regression model.

3.6.2 Independent Variables

Table 3.2 below summarizes the independent variables utilised in the double-hurdle analysis, along with their definitions and expected signs. To provide non-biased parameter estimates, the econometric estimating technique assumed that multicollinearity be managed. The sources of multicollinearity among categorical independent variables were identified through a contingency table analysis utilising chi-squared, contingency coefficients, and lambda; to reduce any heteroscedasticity within the error term, the robust standard error for estimated parameters was utilised. For continuous variables, the bivariate correlation matrix and variance inflation factor (VIF) were utilised to detect and eliminate any collinear variable.

Table 3.2: A list of hypothesized explanatory factors employed in the double hurdle model

Variable	Type	Measurement	Expected sign	
Sex	Dummy	1 = male, 0 = female	+	+
Age	Continuous	Years	+-	+-
Marriage type	Dummy	0 = Monogamy, 1 = Polygamy	+-	+-
Education	Continuous	Number of years schooled	+	+
Household size	Continuous	Number of people in household	+-	+-
Dependent	Continuous	Number of people living in the households as dependents	-	-
Total arable land	Continuous	Total arable land area in acres	+	+
Government project	Dummy	1 = Yes, 0 = No	+	+
Land fertility	Dummy	1= fertile, 0 = Not fertile	+	+
Contract farming	Dummy	1 = Contract, 0 = noncontract	+	+
Maize farm-size	Continuous	Maize farm size in acres	+	+
Quantity of maize	Continuous	Quantity of maize harvested	+	+
Farmer experience	Continuous	Numbers of years in maize farming	+-	+-
Market information	Dummy	1 = Yes, 0 = No		
Nature of road	Dummy	1 = tarred, 0 = untarred	+	+
Market distance	Continuous	Distance in km	-	-
Market access	Dummy	1 = Yes, 0 = No	+	+
Maize market price	Continuous	Ghana cedis	+	+
Farmer group	Dummy	1 = Yes, 0 = No	+	+

Note: *Under expected sign, the first column is for market participation and the second column is for extent of market participation.*

CHAPTER FOUR

ASSESSING THE DESIGN AND OPERATIONALIZATION OF MAIZE CONTRACT FARMING SCHEMES IN NORTHERN GHANA

4.0 Introduction

Chapter four presents contract farming schemes and operationalization in the study area using maize as a case study. Firstly, a broader agricultural development policy of Ghana is presented in section 4.1. Following this, is the analysis of contract farming models operated in the area in section 4.2. This is followed by section 4.3, analysing the nature of contractual arrangements in the study area. Section 4.4 looks at smallholder motivation to engage in contract farming while 4.5 examines contract designs and attributes of the maize CF schemes in northern Ghana. Contracting processes, farmer roles and negotiations have been analysed and presented in 4.6. The contractual terms and conditions are discussed and presented in 4.7. Section 4.8 presents the analysis of the perceive impact of CF on maize yield while the farmers' satisfaction of engaging in CF is discussed in section 4.9. Lastly, the chapter summary is presented in section 4.10

4.1 Ghana Agricultural Development Policy

The national development plan of Ghana has given a top priority to the modernisation of agriculture including the smallholder sector. Two main policies guide the development of agriculture in Ghana: National Development Planning Commission (NDPC) led policies and MoFA led policies. While the NDPC led policies include the President's Coordinated Programme of Economic and Social Development Policies (CPESDP) and the Medium-Term National Development Policy Framework, the MoFA led policies include the Food and Agricultural Sector Development Policy (FASDEP II) and Medium term National Agriculture Investment Plans.

The Presidential medium-term national development plan is the main driver of the national development agenda and it serves as a framework for activities across the country's Ministries, Departments and Agencies. Current programmes under this include '*Agenda for Jobs: Creating Prosperity and Equal Opportunity for All'* (2018-2024), and the medium-term national agriculture investment plan (*Investing for Food and Jobs*). The programme places a lot of emphasis on raising everyone's earnings, generating employment, particularly for young people, and enhancing the environment that encourages private sector investment. The aforementioned policy recognises agriculture as the primary catalyst for job creation, rural growth, and transformation. It also outlines seven key components for agricultural development: (i) market-driven development of products throughout the value chain in agriculture, with a focus on supporting added value in essential agricultural products, (ii) institutional reforms, (iii) production effectiveness, (iv) postharvest management, (v) cost minimisation, (vi) youth engagement in agricultural development and (vii) improved communication. These are approved as the policy goals that will direct the national agriculture investment strategy for the medium term, *investing in jobs and food*.

The CPESDP's medium-term implementation framework for operationalising Ghana's national development goals is known as the Medium-Term National Development Policy Framework. The current framework is called "*Agenda for Jobs*: *Creating Prosperity and Equal Opportunity for All*". It addresses the drawbacks and builds upon the successes of previous medium-term operational frameworks. The country's economy will undergo considerable changes in the medium term, with the agricultural sector playing a major role, according to the current structure. The aims of the CPESDP are addressed by its five development dimensions, which include economic, social, environmental, infrastructural, and human settlements; governance, public accountability, and corruption; and Ghana's position in international affairs. There are seven approved policy goals

that serve as the foundation of the medium-term national agriculture investment strategy. Within the economic development dimension, there is a special emphasis on rural and agricultural development.

The long-term agricultural strategy of Ghana, known as FASDEP, is designed to fulfil both the Malabo-CAADP obligations and the country's development goals. Launched in 2007, it is presently in its second cycle (FASDEP II) and has to be updated to reflect evolving national development results (Nel *et al.,* 2019). The primary objectives, however, remain wide-ranging ambitions that prioritise modernising and transforming the agriculture industry to guarantee food security and generate employment. Throughout, there is emphasis on the need for more private sector involvement and collaboration in order to speed up implementation. In order to address the major production and marketing challenges facing the nation, modernisation and commercialisation of the agricultural sector have been given top priority in Ghana's development goals (GoG, 2017). FASDEP II aims to boost both the competitiveness and integration of farmers in local and international markets. In addition to maintaining food security, the strategy attempts to improve readiness for adverse externalities and shocks. Investing in irrigation and automation, managing the land sustainably, creating capacity, and improving infrastructure are a few of the tactics used within the policy framework to get the intended outcome. Along the agricultural value chain, these strategies were designed to increase both smallholder and commercial farmers' production.

Notable interventions implemented to facilitate FASDEP implementation include Agricultural Mechanisation Services Enterprises Centers, Fertiliser Subsidy Programme (FSP), and the Block Farms Programme (Benin *et al.,* 2013). However, the flagship Planting for Food and Jobs (PFJ) initiative has now incorporated many of these. Although PFJ targets more than ten agricultural

subsectors, maize is prioritized. The programme primarily provides subsidised seed and fertiliser to smallholder farmers. Marketing support is also provided under this policy. However, this aspect of the programme is being neglected, which present concerns about the sustainability of production increases.

To address the marketing issues, the Ghana's National Buffer Stock Company (NAFCO) was created also in 2010 with the objectives of regulating grain supply and stabilising prices. Recently, the Ghana Grains Council (2015) and the Ghana Commodity Exchange (2017) emerged as prominent players in the domestic grain market. With respect to international trade, Ghana's industrialisation strategy adopted in 2012 prioritises exports and promotes import substitution. Maize currently receives protection in the form of a 20 percent import tariff (FAO, 2016).

The Ghana Commercial Agriculture Project (GCAP) was also a project of the Ghana Government implemented under MOFA. The Project Development Objective is "*To improve agricultural productivity of both small-holder and nucleus farms in selected project intervention areas through increased access to reliable water, land, finance and agricultural input and output markets.*" The GCAP was private sector oriented and demand driven project financed by a loan from World Bank (US$100 million) and a grant from United State Agency for International Development (USAID) of US$16.95 million. The project was restructured for a second time in May 2018, requesting (and receiving) an additional fund of US$50 million, and extend the closing date to December 2020. The project is structured into seven (7) components, namely: enhancing investment promotion in infrastructure, facilitating secure land access, ensuring the protection of Public-Private Partnerships and establishing connections with smallholder farmers in the Accra Plains. The project also aims to ensure the security of Public-Private Partnerships and the connections between small-scale farmers in the SADA Zone. It involves implementing the project, including monitoring

and evaluating its progress. Additionally, investments will be made to improve and modernise selected public irrigation and drainage infrastructure. The objectives include the reorganisation and enhancement of public irrigation and drainage institutions, as well as the establishment of Water Users' Associations and private scheme management. In the study area, GCAP supported 6 investors, 22 nucleus farmers and their out-growers. All these have steered the proliferation of CF in the study area.

4.2 Maize contract models in northern Ghana

The theory of change that underlie CF in northern Ghana is that by improving maize productivity and concurrently providing market for smallholder farmers, they participate more in the market resulting in increased in income and subsequently move out of poverty. All the agribusinesses in the study area operate similar business models. They mostly employ CF schemes as a means to reaching many farmers. These CF schemes are interconnected agreements in which agribusiness and traders provide input packages to farmers and the farmers in return, are likely to use a portion of their crop to repay the contractor for value of the inputs obtained. These contract schemes are mostly of two kinds – large schemes run by big agribusinesses entities and small schemes run by individual entrepreneurs, primarily traders. The large CF schemes often involve written agreements between farmers and agribusiness entities while farmers that participate in the small schemes enter verbal agreements with the traders. The small schemes are often based on trust.

The agribusiness enterprises provide farmers with a fixed input pack that includes high-quality inputs and extension services. After the farmers have harvested their crop, they reimburse the enterprises with a pre-negotiated quantity of grain. The exact amount of maize to be paid is usually estimated on the basis that farmers pay the value of the input pack they received from the contract firm. The majority of the packages, particularly those associated with large schemes, comprised

imported hybrid seeds. This study however found that farmers preferred less expensive packs of improved seed but not necessarily hybrid seed. The result is consistent with the literature that suggests that, compared with the improved maize varieties, hybrid maize seeds require more fertiliser (Tripp and Ragasa, 2015). This increases the cost of production and reduces farm revenues. However, studies by IFPRI and ISSER (2016) and IPA, IFPRI and SARI (2016) reported that, hybrid maize seed yielded 15–60 percent more than improved maize seed and is also between 18–90 percent more profitable. Table 4.1 above presents the characteristics of the contract farming schemes operated in the study area.

Table 4.1: Characteristics of contract farming schemes in the study area

Characteristics	Large schemes	Small schemes
Type of contract	Engage in written contract	Engage in verbal contract
Values of incentives	Provide fixed package of quality inputs and extension services	Input package not fixed and is based on the farmers' need and what contractor can provide. Extension services not included
Flexibility (choice of input, crop repayment and sale options	Fixed inputs package usually consisting fertiliser, hybrid or improved seed, extension service provision, weedicides and pesticides	Flexible input package based on the farmers need.
Closeness to open market conditions/incentives	Not close to open market conditions	Close to open market conditions. Farmers can pay with money at current market price.
Crop repayment	Does not accept any produce except the contracted crop	Accept other crop produce or even with money

Source: *Field survey, 2020*

Smaller contract schemes did not include hybrid maize seeds in their input packages and were more flexible in terms of the input packages. These schemes were mostly run by traders whose primary business was buying and selling maize. This study found that the inputs provided in the small contract schemes mostly aligned with farmers' expectations than those provided under the large contract farming schemes. Furthermore, the payment of the input value in the smaller schemes is closer to open market values of the contracted crop and lower than the input value in large schemes. Farmers were often not compelled to sell all of their maize to the traders they entered into contract with, and repayments terms were more flexible in comparison to others. While large schemes did not accept any crop harvest or in-kind payment except the contracted maize crop, small schemes will accept any crop harvest, particularly if it is one of the commodities exchanged by the merchants, as well as cash payments if necessary.

The idea of group contracting was initially implemented with an aim of spreading and minimizing risks. One key feature of group contract farming schemes is collective risk. Default of one member of the group is perceived as liability to the entire group. But this has since changed as fewer and fewer enterprises employ group contract farming scheme. In the group contracting, any default by a member of a group hurt the interests of others because produce of group members has to be used to pay for all defaulted members. This resulted in high exit rate from such schemes as they felt they were being cheated and treated unfairly. Furthermore, new participants are now provided a cheaper package rather than the more expensive hybrid package. Only if they meet the payback requirements will they be offered the more expensive hybrid package the following year.

4.3 Nature of Contractual Arrangements

Figure 4.1 illustrates the nature of contractual agreements entered between the agribusinesses and the smallholder farmers. According to the survey data, there are two different sorts of agreements that constitute the contract between the agribusiness companies and the smallholder maize farmers in the area. These agreements are founded on either written or verbal agreements. According to the data, 131 (77.51%) of the 169 contract farmers who were sampled said they had written contract with the agribusiness companies. The remaining 38 (22.49%) farmers claimed that their agreement with the business firms was a verbal. Some authors note that in their definitions of contract farming, the companies hold the legal rights to the produce or that the farmers' production decisions are governed by the contracts, suggesting the power dynamics involved in (Adams et al., 2019).

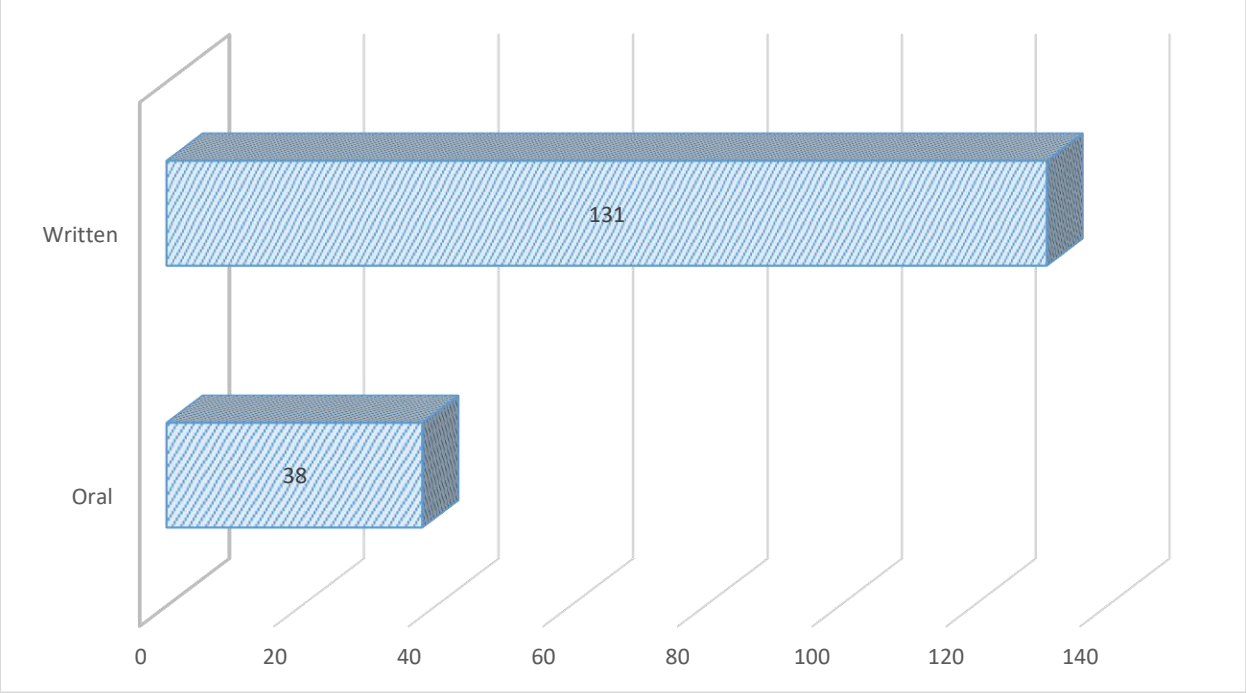

Figure 4.1: Nature of contract design

Source: Field survey, (2020).

Even if they both appear to have similar patterns of arrangements, each contractual agreement has a distinct feature that sets it apart. Before being permitted to engage in some of the contract farming programmes (e.g., Augustine's farm), farmers are needed to have a guarantor to act as collateral and other written agreements do not call for a guarantor. Verbal (oral) communication does not require any written documentation because it is built on mutual trust between the companies and the farmers. These verbal contracts are operated by individual entrepreneurs who have done business with these farmers for a long period of time in the study area. Makafui (2015) noted that these two contract types concentrate on the forward assistance, supply, and demand requirements of both the farmers and companies. These contracts usually span one year after which new contracts are entered into again, suggesting that the firms do have a specific tenure of contract duration with all the farmers involved.

4.4 Smallholder Farmers' Motivation to participate in contract farming

An important element behind the approval of a contract by smallholder farmers is that they will usually make a bid that is more profitable or superior to the alternatives that farmers might otherwise receive for non-participation in a contract. However, smallholder contract acceptance does not necessarily result in a contract being considered fair, but rather households in contract are expected to be better off at least than without a contract (Barret *et al.*, 2012).

This study investigated the reasons behind households' involvement in maize contract farming schemes in the study area and results are shown in Table 4.1. Roughly 74.8 percent of households interviewed showed that they are part of contract farming to receive higher maize output prices. This was especially true for farmers who were engaged in seed production as companies are offering higher prices than open markets. These farmers were also required to sell all maize

cultivated under the contract to the firm. This result is consistent with Bellemare and Bloem (2018) who view CF as an economic entity that tackles price and production information imbalance.

Table 4.2: Reasons for smallholder farmers to participate in contract farming

Variable	Mean	Standard deviation
High output price	0.748	0.435
Increased yield	0.986	0.116
Access to quality inputs	0.911	0.286
Access to credit	0.691	0.463
Guaranteed market or buyer	0.678	0.469
Access to knowledge or technical assistance	0.745	0.437
Guaranteed minimum output price	0.807	0.396
Reliable payment	0.814	0.391
No need to organized transport to market	0.8	0.401
Reliable input supply	0.952	0.215
Unit of measure of output is scale	0.841	0.215

Source: field survey, 2020

Importantly, increase in maize yield was mentioned as one of the reasons why small farm households participate in contract farming schemes in the area. Approximately 98.6 percent of the farmers involved in maize contract farming mentioned that they engage in it to increase their maize yield. The market for agricultural input is characterized by imperfections in northern Ghana, which means agricultural households face challenges in obtaining inputs in order to increased maize productivity. Agribusinesses and individual entrepreneurs (traders) enter into contractual agreements with farmers for the provision of these inputs on credit which are paid with maize only

after the farmers have harvested maize. For instance, one such agribusiness is Regional Marketing Group Ghana (RMG) in the area and it provides farmers with input on credit for maize contract farming in northern Ghana. This motivates farm households to participate in contract farming and subsequently benefit from high yield in return. Elsewhere in Western India provinces Miglani *et al.* (2018) noted that farmers were participating in contract farming because they wanted to boost their yields.

Also, farm households who participated in contract farming cited access to quality inputs as the reason for joining contract farming schemes in the area. For instance, under the contract agreement, farmers are provided with fertiliser, improved or hybrid seeds, herbicides and insecticides. Because of imperfection in input market, farmers have restricted access to specialised inputs. The hybrid maize seed for instance yield better as compare to the improved and recycled seed but very expensive, thus smallholder farmers may participate in contract farming to receive high quality maize seeds (hybrid seeds) for production. These seeds have a high germination percentage and give better yield as compared to recycled seeds. However, these seeds are very expensive to the farmers as poverty is mystery in the area. Therefore, in order to get access to high quality seeds which are very expensive from the farmers' point of view, one is motivated to adopt contract farming so as to access the high-quality seeds from the contracting company. As illustrated by the Table 4.2, 91.1 percent of contracted farm household interviewed indicated they were motivated to participate in maize contract farming schemes through the provision of high-quality maize seed. Abebe *et al.* (2013) reported that contract farming arrangement has the potential to reduce uncertainties in seed quality if the contracting company supply the seeds as part of the agreement in the contract.

In northern Ghana, larger numbers of farm households face difficulties gaining credit for crops production. These difficulties have increased with commercial banks not ready to lend to small farmers and the change in focus of the Agricultural Development Bank. Contract agreement can allow small farmers to access credit to finance their production processes. The contractor or agricultural firm may advance loans to the farmers, or may arrange to provide the farmer with access to credit with agribusiness companies or the contractor as it can serves as guarantor or collateral for banks or even government agencies to advance credit to smallholders. Banks will not provide farmers with credit without a guarantor or collateral, especially when the risk in farming is considerable high. During group discussions we observed that many participants in contract farming schemes had tried unsuccessfully to borrow from commercial banks. Almost all commercial Banks require some form of collateral before approving loans. About 69 percent of farm households producing under contract and participated in this study were motivated by the access to credit to engage in maize contract farming scheme. This result shows that farmers have a strong desire to join contract farming if there is the high prospect of securing credit facilities. This result is supported by Ragasa *et al.* (2018) who found that contract farming was more appealing to credit constraint smallholder farmers who have a strong history of borrowing.

Often, because the opportunities for marketing their produce are limited, smallholders are only limited in what they produce. This implies that some farmers may deliberately not produce surplus unless the market for the sale of their crop products is assured. Similarly, agri-business firms will not invest in projects which fail to demonstrate the ability to maintain a steady stream of supply of the required farm produce. Contract-farming arrangements offer potential solutions in this situation by serving as some form of guarantee of market for farmers' produce. Approximately, 68 percent of maize farm households interviewed producing maize under contract suggested

participating in contract farming to have a safe market for their maize output. These farmers said that they were growing maize for a seed company, which under this arrangement promises to purchase all maize products. They were assured of higher price for their maize relative to priced offered in the open market. Barrett *et al.* (2012) argue that households do not generally participate in contract farming if they perceive that participation would not help remove market constraints they faced previously or help the household deal with new and emerging risks. Also, Solidaridad, SNV, HIVOS and AgriProFocus, (2016) study found that contract farmers praised the contract farming scheme for delivering a reliable and safe market for their produce.

New technologies to upgrade products are often needed for agricultural products requiring high quality standards. New production technologies are crucial to increasing productivity as well as ensuring that the requirements of the product market are met. On the other hand, smallholders often hesitate to adopt these because of the costs and risks involved in introducing new technologies. Once technological inputs and external resources for materials can be used, small-holders are more likely to accept new practices. Farm households may be motivated by the need for access to information on new technology, quality standards and timing. In order to introduce new technologies, farmers require a well-managed and structured farm to succeed. In addition, new technologies are more diligently provided by agribusiness enterprises than the government's agricultural extension. The private enterprises have a direct economic interest in improving smallholder farmers' production. Some of the contracting companies offer the farmers with whom they work by offering them technical assistance. This technical support tends to focus on appropriate management practices and on the proper use of specialist inputs made available under the contract to farmers. The reason why agribusiness entities provide technical assistance in contract farming agreements is to ensure that the crop produce meets the quality standards set

under the agreements. The study found that maize farmers who enrolled in contract farming schemes were motivated by the prospects of gaining access to the technical assistance included as part of the incentive package. The focus of this technical help is mainly on management practices and the proper use of special inputs provided under the contract to farmers. The study found that about 75 percent of farm households who were contracted to produce maize were motived by the opportunity to obtain the contracting company's knowledge and technical assistance.

The on-farm revenues from the open market depend both on prevailing market prices and on the ability of farmers to negotiate with buyers. Contract farming agreements enable farmers overcome the constraints of price instability and the lack of market power to engage directly with buyers. Contracting companies fixed output prices during the initial stage of contract agreement and these output prices are regularly checked and reviewed upwards based on the prevailing open market price as season ends. Some of the contracts are not based on the fixed prices, but are associated at the time of delivery with open market prices. The contracted farmer is obviously dependent in these cases on market volatility. Contract farming was used by maize farm households in the study area to ensure a minimum price for their maize output. These farm households agreed on a minimum price at the start of the production season before beginning production, which is reviewed before the end of the season.

4.5 Maize contract farming design attributes

Farming under contract whether verbal or written agreement, generally involves contract design attributes which specifies contract obligations and responsibilities for the parties involved. Design attributes of contracts is largely perceived to have an influence on smallholder farmers' participation decisions. Table 4.3 below shows contract obligations and responsibilities in the study area. In this current study, the specification of contract provisions and obligations include

being part of a group, educating the farmers on the objectives of the contract scheme, provision of contract document, nature of contract, land area under the contract scheme, fixed inputs prices before the start of the season, sell all output to contractor, minimum quantity given to contractor, quality requirement and provision of technical assistance.

Table 4.3: Maize contract farming attributes in northern Ghana

Variable	Mean	Standard deviation
Group membership	0.848	0.360
Education on objectives of contract farming	0.887	0.317
Contract document	0.383	0.488
Spent time to understand the document	0.413	0.495
Average land under contract	4.780	5.771
Nature of contract (written)	0.730	0.445
Fixed input prices before start of season	0.978	0.147
Sell all output to contractor	0.015	0.120
Minimum output given to contractor	0.948	0.223
Quality requirement	0.818	0.388
Technical assistance	0.693	0.463

Source: *Field survey, 2020*

Membership to farmer association is a key contract design attribute under some maize contract farming schemes in the study area especially with farm households dealing with contracting firms and not individual entrepreneurs. The reason according to the contracting companies was that group members will serve as a check on other farmers as farmers lived in the same communities

and know one another very well. By this, the farmers will not allow anyone who is not trustworthy to participate in the process. A field officer shared his experience with group contracting:

> *The majority of contract farming organisations in this region prefer to work with farmer groups since it is simpler to handle contract participants and members function as each other's watchdogs, ensuring that project goals are realized.*

According to the farmers, the farms of every member of the group are known to all group members, it will be difficult for a farmer to tell the contractor that his or her farm under the contract scheme has performed poorly if the opposite has happened. This implies that farmer group in the contract agreement serves as an incentive for the smallholder households to participate in the contract farming. Group membership offered social collateral for the individual farmers to engage with the contracting company. Some agribusiness companies operating in the area offer contracts through farmer groups while others contract farmers through an out-grower. This allows for easy delivery of inputs and extension services. The group also make sure that farmers adhere to agreements regarding performance.

As illustrated by Table 4.3, more than 84 percent of the farm households contacted have indicated that membership to a farmer association was key for a farm household to participate in maize contract farming schemes in the area. The farmers have indicated that every group have bye-laws which are used as contract enforcement mechanism including removal and severe warning of defaulted members. In this regard, farmer groups are vital in fostering relationship of the farmers and reducing default through pressure from other farmers in the groups. The findings by Bosc (2018) supports this claim that membership in registered farmer institutions like agribusiness centers, farmer-based organisations, and cooperatives was a prerequisite for smallholder farmers' participation in the Agricultural Value Development Project in Sierra Leone over a six-year period.

Barrett *et al.* (2012) reported that regardless of having to pay membership fee of cooperative in Ghana, pineapple farmers participate because the groups have the financial power to take class actions when there is a breach of contract, better bargaining power and the ability to demand better conditions under contracts. Despite the apparent benefits of contract farming, there remain inherent constraints that place farmers at a disadvantage. One common feature of contract farming models is the unilateral determination of input prices by contracting companies while still maintaining the option not to buy all produce of contracted farmers. This arrangement this study observed, has been leveraged by some companies to exploit famers.

Information from focus groups discussions and key informant interviews showed that, the contract designs does not require any intermediary in order for the contract to work. This is because the households believe that decisions regarding production and marketing of the maize are individual decisions and not collective. The households alluded that there was a certain degree of mistrust of intermediaries. Farmers are of the opinion that, engaging with intermediaries might come at a cost especially where the agent decides to engage in some underhand dealings with the contracting companies.

The lack of negotiation in the drafting of contracts in all the models remains a challenge. In all the maize contract arrangement practice in the study area, the contractor prepares the contract agreement and present same to the farm households and a household can either accept or reject the package because household have little chance of negotiating with the contractor. This lack of negotiations in the drafting of contracts highlights the imbalance in power relations between farmers and agribusiness entities engaged in contract farming.

4.6 Contracting processes, farmer roles and negotiation

Contract development process is very critical for developing trust between the contractor and smallholder farmers. Contract development involves many stages including contract formation which consists of several steps including exchange of information and negotiation, presentation of offer by contractor and farmers' acceptance of offer and the preparation of the contract itself (FAO, 2017). The best practice of the contract formation process is for the contract to be fair and transparent. The smallholder farmers are expected to be involved in the discussions relating to the contract formation and negotiation process from the start to the end. This is to ensure that the smallholder farmers comprehend all conditions included in the contract and to ensure that their rights and interest are taken into consideration when the contract is developed. The practice in the research area varies significantly from the standard or prescribed contracting process. The study found that smallholder maize farmers in this study were not involved in the contract formation and negotiation phase. Contracts were prepared by the firms and presented to the farmers, outlining all the conditions of the contract for them to accept. These contracts are either verbal or written. The inputs of the smallholder farmers were not taken into account when contracts were prepared. This implies that farmers either '*take it or leave it'*. This supports the study of Mazwi *et al.* (2018) who found that contract agreements were exclusively drafted by agribusiness companies without adding the inputs of the smallholder farmers who were going to enter into the contract.

Notwithstanding the limited power farmers have in contract negotiations, they are still given a fair chance to understand the terms and conditions of the contract before signing. The contracts are usually read and discussed with farmers after which interested farmers are given the opportunity to sign the contract document and thus become contracted farmers within the various schemes. It was observed that, farmers' participation in contract farming schemes had little to do with how

good the terms of the contracts were but rather the absence of alternatives. During group discussions, farmers indicated that they had no choice but to accept the contracts offer because they were in need. The summary of the matter is that contract farming schemes in the study area appear better than middlemen and market queens on paper but in the long-run the conditions, market power and prices offered for produce do not vary significantly from the farmers. A male maize farmer in Wa East District of the Upper West Region has been a contract farmer for five years and has shared his perspective on the contracting processes in the various schemes.

> *Our inputs do not matter in this contract, the final decision is taken by the company but because we are in need, we have to accept it like that*. Another farmer said, *they came and told us what they have and we join.*

To make matters worse for the smallholder maize farmers, the contracts are prepared in a language (English) not understood by all farmers, implying that farmers who have no or little education are placed at an injurious position by going into agreements which is not fully understood by them. Farmers who agree to the contracts particularly the written contracts are given copies of contract documents to serve as binding for the two parties. As to whether farmers actually understand the contracts, they sign, discussions with one technical officer suggests that some farmers do not have complete understanding of the contracts. The lack of any structural platform in which smallholder farmers can give their inputs when the contracts are being drafted is reflective of the unequal power relations inserted in the contracting process which favour the contract providers (Mazwi *et al.*, 2018).

4.7 Terms and conditions of the contract agreement

The terms and conditions stated in the contracting document are expected to be mutually binding, with both the contractor and farmer obliged to abide by the terms of the agreement. Under the

contract agreement, farmers were provided with inputs including fertilisers, herbicides, chemicals and extension services. Accepting the input (incentive package) is obligatory for any farmer who wish to participate in the scheme especially for farmers who enter into written agreements. However, the inclusion of tractor services as an incentive package was no longer done because many farmers often opted not to use this service.

With regards to quantity of maize that a farmer should sell to the company contracting them, the terms and conditions are that farmers are supposed to sell all maize under contract to the companies. However, as indicated earlier, this rarely happens. Discussions with farmers indicated that some of the farmers (especially farmers contracted to produce seed) actually abide by this agreement. These farmers reported that the price the companies offer at the time of purchase of their maize were more encouraging than in the open market. Others farmers also believed that one must return the good offered him/her in other to get more. One of such farmers had this to say

If someone help you to benefit, you have to also return that back by honoring the promise.

4.8 Perceive impact of contract faming scheme on maize yield

The study also sought the views of participating farmers on their perceive impact of contract farming on yield. A five-point likert-scale of (1) increased significantly, (2) increased, (3) remain constant, (4) decreased and (5) decreased significantly. Results of the likert-scale analysis is presented in Figure 4.2. Statistics from Figure 4.2 have shown that 24 percent of the farmers perceived CF to have increased their yield significantly relative to previous yields under no contracts. Similarly, majority (63%) believed that their yield of maize under contract have increased but not significant relative to what was gotten under no contracts while 11 percent do not perceive any changes in maize yield as a result of participation in contract farming. However, two farmers have observed decrease in yield as compared to previous yields under no contracts.

The mean response was 1.87, suggesting that there was a perceived increased in maize yield resulting from contract participation. This finding is in tandem with several other studies that assessed impact of CF on the yield of smallholder farmers (Danso-Abbeam *et al.*, 2023; Liang *et al.*, 2023; Bidzakin *et al.*, 2020).

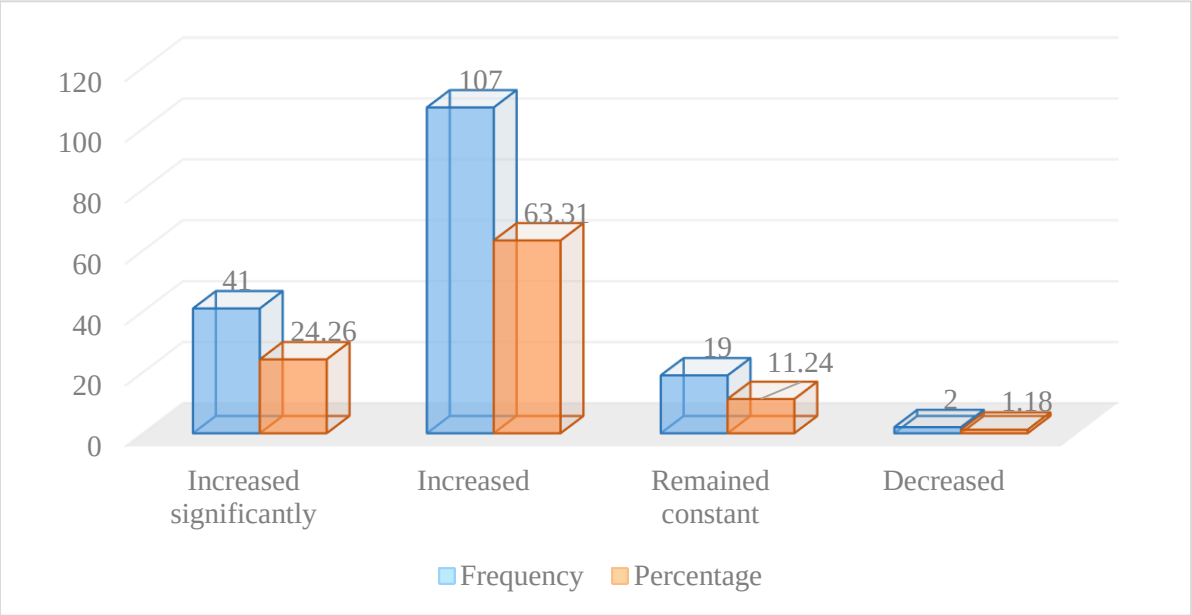

Figure 4.2: Perceive impact of contract farming
Source: *Field survey, 2020, Mean = 1.87*

4.9 Satisfaction of contract farming participation

This study looked beyond economic gains of CF arrangement and asked the participant farmers if they are given the opportunity under current conditions whether they will want to participate in the maize contract farming the next season. The rationale was to understand the level of satisfaction of participating farmers under the contract agreement. Under the current contract conditions, the farmers reported that they were very satisfied with the contracts they enter into with the

agribusinesses. They indicated that they were able to pay back the cost of inputs provided to them and still have surplus to sell. The farmers in expression their satisfaction said the following

It can help me to improve production.

It very helpful to us compare to previous seasons when we were not engaging in contract farming arrangement.

The start of the season we do not have much money for tractor services and at the same time buy inputs but because of them we do not have to worry about inputs again all we need now is money for tractor services.

The farmers expressed the desire to continue to participate in contract farming if given opportunity and with the same contract conditions. About 40 percent were dissatisfied with the contract farming schemes. The farmers indicated that activities of contract farming in the area is reason for the widespread use of high-quality seeds in the area. A 33-year-old farmer in the Upper West Region said;

Masara pushed us to use inputs by giving the inputs to us on credit. Initially, we do not have anybody to give to us these inputs on credit, so we were not producing to sell but to feed the family. But we are now producing to sell because the company is buying the maize from us too.

Also, the farmers have shown that provision of the inputs has reduce their labour requirement as they no longer need more labour on their maize farms as a result of the herbicides included in the package. This has shortened the time spend for weeding. This is what a female farmer in the Wa East District said;

I no longer spend much time weeding my maize farm and I can farm more acres of land because herbicides are used to control weeds growth which reduce the amount of labour that I would have required to weed my maize farm.

However, other contracted farmers indicated regret in participating in CF arrangement by criticizing the high production cost involve in contract production. This result agrees with the findings of Ruml and Qaim (2021) who noted that even though smallholder farmers' benefits from CF in terms of higher productivity and income, many farmers still disappointed with their decision to partake in the CF and would prefer to exit from the CF scheme if they could.

4.10 Summary of chapter

In this chapter, the nature of contract arrangements was analysed and it was identified that the farmers entered into contracts based on the kind (verbal or documented arrangement) between the company and the farmer. What determine the type of contract entered by the smallholder farmers is the size of the agribusiness enterprise and the value of the incentives given to the smallholder farmers. When the agribusiness enterprise is a firm or company, they provide a fixed input pack with extension services, a written contracts is agreed and a verbal arrangement is agreed when the contractor is an individually enterprise who provide specific inputs to farmers without extension services. However, it was observed that the same contract duration (1 year) exist between farmers and the agribusiness enterprises.

Farmers are motivated by a number of factors in their decisions to participate in contract farming schemes. Increase yield, access to quality inputs, reliable input supply, access to technical assistance and a guarantee minimum price were some of the reasons why maize farmers engaged in contract farming in the study communities. However, maize farmers in the study communities do not participate in the design of the contracts. Contracts are designed by firms without inputs

from smallholder farmers and presented to the farmers, outlining all the conditions of the contract for them to accept. These are either verbal or written contracts. The terms and conditions under the contract arrangements include several support services such as farm inputs (hybrid maize seed, fertiliser, weedicides and pesticides) and extension services from the firms. It was identified that these supports services were given at various stages of the production season. Farmers in return are expected to pay the value of inputs taken with part of the maize produce and sell all maize produce under contract to the firms.

Finally, how farmers perceived impact of contract farming on maize yield was also examined in this chapter. The study observed that, the prospect of yield increases was a major driving factor participating in contract farming. Under the current contract conditions, the farmers reported that they were very satisfied with the contracts they enter with the agribusinesses. They indicated that they were able to pay back the inputs provided to them and still have more which can feed their families with surplus to sell.

CHAPTER FIVE

IMPACT OF CONTRACT FARMING ON MAIZE YIELD AND NET FARM INCOME (FARM PERFORMANCE)

5. 0 Introduction

The interplay of factors that determine participation in CF and the effect of CF on maize yield and net farm income (farm performance) are presented and discussed in this chapter. The study applied the Full Information Maximum Likelihood Estimation to estimate endogenous switching regression (Clougherty et al., 2016; Lokshin and Sajaia, 2004). This chapter is divided into five sections. Household and farm characteristics of CF and non-CF farmers are presented in section one. Section two delves into the first-stage Probit estimation method for determining the drivers of smallholder farmers' decisions to partake in maize CF schemes. The second-stage results on the determinants of maize yield per acre and net farm income are examined in section 5.3. The average treatment effect results of the effect of maize CF participation on maize yield and net farm income are discussed in Section 5.4. Lastly, the summary of the chapter is presented in section 5.5.

5.1 Farm and household characteristics of CF and non-CF farmers

Results of the sample t-test analysis as shown in Table 5.1 compared the means of chosen variables based on participants' status of CF participation. The analysis was performed on a sample of 420 smallholder maize farmers. The table shows that major demographic and socioeconomic characteristics among maize CF and non-CF farmers were significantly different. Between CF and non-CF maize producers, there was an average age difference of around two years. At the 10 percent significance level, this difference was statistically significant, indicating that older farmers were more likely to use CF techniques. This contradicts a *prior expectation* of this study and other earlier investigations.

Table 5.1: Farm and household characteristics of CF and non-CF farmers

Variable	Pooled (420)	Non-contract (251)	Contract (169)	Mean diff.
Age	39.640 (0.583)	38.764 (0.741)	40.941 (0.937)	-2.176*
Sex	0.907 (0.014)	0.940(0.015)	0.858 (0.027)	0.082**
Household size	9.652 (0.273)	9.104 (0.334)	10.467 (0.457)	-1.364*
Marital status	0.879 (0.016)	0.841 (0.023)	0.935 (0.019)	-0.094**
Type of marriage	0.264 (0.022)	0.251 (0.027)	0.284 (0.035)	-0.033
Years of education	3.345 (0.264)	4.028 (0.367)	2.331 (0.351)	1.697***
Literacy	0.214 (0.020)	0.255 (0.028)	0.154 (0.028)	0.101*
Child labour	2.005 (0.111)	1.769 (0.134)	2.355 (0.187)	-0.586**
Adults 18 and above	5.564 (0.188)	5.171 (0.218)	6.148 (0.333)	-0.977*
Adult labour	4.169 (0.146)	3.789 (0.134)	4.734 (0.299)	-0.945***
dependents	4.976 (0.268)	4.721 (0.329)	5.355 (0.451)	-0.634
Major economic activity	0.924 (0.013)	0.880 (0.021)	0.988 (0.008)	-0.108***
Off-farm work	0.314 (0.023)	0.299 (0.029)	0.337 (0.036)	-0.038
Land ownership	0.821 (0.019)	0.876 (0.021)	0.740 (0.034)	0.137***
Total arable land	12.857 (0.599)	10.610 (0.524)	16.195 (1.226)	-5.586***
Land area cultivated	6.688 (0.315)	5.420 (0.258)	8.571 (0.656)	-3.151***
Land quality	0.405 (0.025)	0.351 (0.032)	0.485 (0.039)	-0.135**
Government project	0.190 (0.019)	0.147 (0.022)	0.254 (0.034)	-0.107**

Note: ****, ** and * shows respectively 1%, 5% and 10% significant level*
Source: *Field survey, 2020.*

However, this finding is similar to Bezabeh *et al.* (2020) who found that younger farmers are less incline to engage in CF as compare to the older farmers. In contrast to non-CF farmers, the proportion of women who participated in maize contract farming was much lower. The low representation of women in these contract farming interventions in northern Ghana could be attributed to prevalent male domination in staple crop cultivation or male-headed households. In many farming communities in Northern Ghana, cereal and grain production is traditionally male-

dominated, while women are more engaged in horticulture (vegetables), legumes (groundnuts, cowpeas, soybeans), and post-harvest processing activities. Social norms and gendered divisions of labor often position men as the primary decision-makers in staple crop production, making it difficult for women to gain recognition or authority in contract farming arrangements. Furthermore, some agribusinesses and contract farming schemes tend to engage directly with male-headed households, reinforcing the exclusion of women from contract negotiations and decision-making processes. This is consistent with Meemken and Bellemare (2020) and Bezabeh *et al.* (2020) who observed that female farmers were much less liable to engage in CF.

From the data, CF farmers have a much greater number of people in their households than non-CF farmers, and a relatively high percentage of married households, as well as polygamous households. In terms of education, CF farmers spent significantly fewer years in school than their counterparts who did not. With fewer years of schooling, CF farmers may have limited literacy and numeracy skills, which can hinder their ability to read, interpret, and negotiate contract terms effectively. This puts them at a disadvantage, as they may fail to understand pricing structures, cost-sharing agreements, or penalty clauses, leading to potential exploitation by agribusiness firms or intermediaries. The number of farmers that could read and write were much higher among non-participant farmers. In comparison to non-contracted farmers (88.0%), a higher number of contracted farmers (98.8%) had agriculture as their primary economic activity. Dubbert (2019) reported that the fraction of cashew farmers who participated in CF schemes regarded cashew cultivation as their primary source of income in Ghana was higher than the proportion of non-contract farmers who cultivated cashew as a supplementary cash crop.

Contract farmers had more children than non-contract farmers working on their maize farms. Adult labour was also notably high among the contracted farmers. Contract farmers have more adult

members than non-contract farmers, which could explain why contract farmers have more adult labour working on their maize farm than non-contract farmers. CF participation by smallholder farmers is sometimes attributed to their land ownership. In terms of land ownership, Table 5.1 shows significant discrepancies between contract and non-contract farmers. Non-contracted farmers own around 87.6 percent of the land they presently farm, whereas contract farmers own about 74 percent of the area they presently farm. In addition, CF farmers own more arable land and cultivate a larger area of land than non-CF farmers.

Non-contracted farmers were involved in nearly 30 percent of off-farm activities, while contract farmers were involved in around 33 percent of off-farm activities. CF and non-CF farmers did not differ significantly in terms of their engagement in activities conducted outside of their farm. While roughly 35 percent of non-CF farmers perceive their land to be fertile, 48.5 percent of contract farmers perceive otherwise. CF farmers were more likely than non-CF farmers to participate in community-based government projects. The proportion of farmers that have participated in cash crop production was greater among contracted farmers and 15.4 percent of CF farmers also keep farm operations records, compared to 9.2 percent of non-contracted farm farmers.

5.1.1 Inputs usage of contract and non-contract farmers

The average input utilization by both contracted and non-contracted farmers in the research area is presented in Table 5.2 below. CF farmers applied an average of 56.75kg/acre more of NPK fertiliser to maize farms than non-contract farmers. This observation suggests that CF may produce a major effect on the quantity of NPK fertiliser used on the maize farm. In addition, the study found that CF farmers used more fertiliser as compared to farmers who were not engaged with CF schemes. In the case of urea, farmers under contracts use roughly 6.196kg/acre more. Farmers under contracts also used more ammonia (7.120kg/farmer and Activa (4.194kg/farmer). Due to

CF participation in on-going intervention and the availability of a ready markets, they are supported with the required inputs.

Participants in maize CF used more of improved seed than non-contract farmers in the research area. Farmers under contract utilised an average of one kilogram more of improved seed per acre than non-contract households. Contracted farmers were also found to be using more hybrid seed than non-contracted farmers and non-contracted farmers used more recycled seeds from their harvest. Furthermore, farmers that participated in CF used an average of 1.095 litres of herbicides per acre, compared to 0.903 litres/acre for farmers who produce under no contract. The preceding explanation demonstrates that CF is a viable alternative for technology adoption.

Table 5.2: Inputs use of smallholder farmers

Input	Pooled (420)	Non-CF (251)	CF (169)	Mean diff.
NPK fertiliser (kg)	116.920 (3.667)	94.085 (3.768)	150.834 (6.366)	-56.749***
Urea (kg)	4.790 (0.958)	2.296 (0.892)	8.493 (1.946)	-6.196***
Ammonia (kg)	25.783 (1.765)	22.922 (1.968)	30.031 (3.250)	-7.1098**
Activa (kg)	9.435 (1.275)	11.122 (1.480)	6.928 (2.274)	4.194
Hybrid seed	3.977 (0.800)	1.857 (0.459)	4.389 (0.939)	-2.532
Improved seed	2.634 (0.149)	2.067 (0.172)	3.127 (0.225)	-1.060***
Recycled seed	7.410 (2.596)	8.097 (3.114)	4 (0.687)	4.097
Herbicides	4.175 (0.322)	0.903 (0.065)	1.095 (0.102)	-3.155***

Note: ****, ** and * shows respectively 1%, 5% and 10% significant level*
Source: *Field survey, 2020.*

5.1.2 Institutional and outcome variables

The statistics derived from the data on institutional and outcome variables used in this study are presented in Table 5.3 below. Around 23 percent of the respondents belonged to farmer-based organization (FBOs). Only 2 percent of non-contracted farmers belonged to farmer-based organization (FBOs), compared to 54 percent of contracted farmers. The findings imply that more CF farmers were members of farmer-based groups, and the test statistic indicates statistically significant difference between the two groups. Farmer group membership in rural communities is largely driven by social networking, which allows farmers to learn about new technologies and CF activities. Farmers' decisions to enter maize CF and also participate in commercial maize farming may be influenced by their social network of friends, relatives, and religious members (Danso-Abbeam *et al.*, 2022).

In smallholder agriculture, access to extension services is critical because farmers require timely and better access to quality information to make informed decisions regarding their crop production. Smallholders' knowledge and skills are projected to grow because of access to extension services, which would connect them to markets and increase technology and input use. The percentage of sampled farmers who received extension services in this study were less than 25 percent. While less than 10 percent of non-contracted famers received extension services, these services were available to half (50%) of CF farmers. The high access of contracted farmers to extension services could be due to their participation in CF schemes. In the study area, many of the maize contract farming schemes have included extension services as part of the contract agreement.

Table 5.3: Institutional and performance variables

Institutional variable	Pooled (420)	Non-contract (251)	Contract (169)	Mean diff.
Farmer group	0.229	0.020	0.539	0.5185***
Extension access	0.236	0.060	0.497	0.4373***
Credit access	0.060	0.036	0.095	0.0588*
Yield per acre (kg)	930.150	501.053	1567.448	1066.395***
Revenue per acre	1086.47	334.420	2203.410	-6.0804***
Total cost per acre	609.57	386.320	941.140	-3.7451***
Net return (GH¢)	476.894	-51.901	1262.260	-3.8122***

Field survey, 2020. ****, ** and * shows respectively 1%, 5% and 10% significant level*

Farmers in northern Ghana, particularly in rural areas where poverty is high, face several credit access constraints. This could be due in part to lack of growth in clientele base and limited innovation to increase inclusivity. This may have an impact on technology adoption, particularly if the technology necessitates capital expenditures. Generally, risk associated with agriculture is a major challenge hence affecting effective demand. As a result, participating in contract farming could assist rural farmers overcome financial limitations to the adoption and use of technology. Out of a total of 420 farmers surveyed, only 6 percent had accessed credit. Contracted farmers had greater rates of credit access than non-contracted famers. The fact that contracted farmers appeared relatively more credit worthy than non-contracted farmers, evidenced by the willingness of lenders to grant contract farming participant's credit. Farmers can use loans to purchase productivity-enhancing inputs like better or hybrid seed, fertilisers, and chemicals which will help generate more surplus for market participation.

According to Table 5.3, on average, a farmer received 930.150kg per acre of maize planted as harvest. In comparison to non-contracted farmers, contract farmers' maize yields were substantially greater on average. Non-contracted farmers got around 501.035kg (5 maxi bags) per acre, while contract farmers got 1,567.448kg per acre (15 maxi (100kg) bags). This high yield per acre achieved by contract farmers may perhaps be ascribed to higher access to quality inputs, credit and maize farming information.

In terms of profit, a maize farmer in this study received around 4,034.394 Ghana cedis per acre of maize planted. A farmer that grew maize under contract earned substantially more money than a household that did not. Contract farmers received around GHS 1262.264 per acre, while non-contract farmers received around GHS -51.901 per acre. The profitability of contract farming among contracted farmers could be because they had better access to better output markets provided by the contractor, Setboonsarng et al. (2008) reported that, the huge profit margins attained by contracted farmers made it easier for subsistence farmers to switch to commercial agriculture, potentially reducing rural poverty.

Tables 5.1, 5.2, and 5.3 showed that there are systematic differences across many observable factors between CF and non-CF farmers. This implies that engagement in CF may have selectivity issues. Simple comparisons of these mean differences between CF and non-CF farmers will not account for unobservable factors, and the results may be skewed (Dubbert, 2019). As a result, econometric methods must be used to uncover the bias induced by selection in CF, and to analyze the influence of CF on farmers' performance.

5.2 Factors Influencing Farm Household CF Participation Decisions

The first stage probit estimation of the endogenous switching regression on the variables which influence the decision of smallholder farmers to engage in CF is shown in Table 5.4. The estimated

model was significant statistically according to the *LR-chi square (p = 0.000)*, implying that the independent variables in the equation significantly and jointly explained the farmers decisions to engage in CF. The estimated results illustrated that 10 variables were significant in explicating the decisions of the farmers to partake in maize CF. These variables include Age of farmer, maize farm size, extension access, hired labour, location, market distance, market access, mobile phone ownership, farmer group membership and nature of road network.

From the estimation, age had a negative coefficient that differed significantly from zero. The coefficient of age was negative and significantly different from zero (Table 5.4), indicating that younger maize farmers were likely to engage in maize CF schemes than their older farmers. A more plausible explanation for the negative coefficient of age in the estimation could be that older farmers are generally more risk-averse and less likely to adopt new agricultural practices or market opportunities compared to younger farmers. Additionally, they may have diminished physical capacity, which can reduce their ability to engage in labour-intensive farming activities or expand their production scale. Studies such as Ziyadhuma (2020) also found similar results and suggested that youthful farmers are more active than older farmers and may thus participate in labour-intensive agricultural activities such as maize cultivation. A contrary finding was discovered by Dubert et al. (2021) who found a positive effect on contract participation in Ghana.

Table 5.4: First stage estimation: Drivers CF participation decisions

Variable	Contract participation	
	Coeff.	**Std. err.**
Sex	-0.0517	0.361
Age	-0.7567*	0.411
Education (number of years)	-0.1487	0.093
Household size	0.0707	0.194
Number of dependents	0.0217	0.200
Maize farm size	0.4973**	0.239
Experience	0.0052	0.194
Extension access	1.0689***	0.304
Farmer group	1.6167***	0.364
Hired labour	0.3682*	0.201
Access to market	0.9541***	0. 265
Mobile phone owner	-1.3019***	0.363
Market distance	-0.6231**	0.316
Location	1.2235***	0.242
Nature of road	1.5940***	0.403
Constant	0.7612	1.594

Note: ** 10% significance level; **5% significance level; ***1% significance level. Standard errors are robust, Log likelihood = -1213.1289; LR chi2 = 117.68 (p-Value = .000).*
Source: *field work, 2020.*

Farmers who cultivate larger farms tend to take part in CF, as indicated by the positive sign exhibited by the coefficient of the variables maize farm size, which was significantly different from zero. This is predicted as it supports the hypothesis that farmers with bigger farms are more inclined to receive an offer to sign a contract that would result in a cost savings for the buyer in terms of transaction fees (Dubert *et al.,* 2022; Dubert, 2019). This implies that farmers' participation in CF increases with farm size. However, this finding oppose the results of Danso-Abbeam et al. (2022), who found that increased farm size of a farmer reduces the chance that the farmer engaged in CF.

Receiving services from extension agents also improves the chances of participating in maize contract farming. Maize farmers that receive regular visits from extension workers, attend demonstrations or field trials are likely to embrace CF due to greater exposure and awareness of new technologies accompanying CF arrangement. Farmers can only join CF if they are aware of its availability, benefits, and fundamental qualities and such information may be available to the farmers through extension services. This finding highlights the importance of knowledge in lowering risks and uncertainties associated with technology adoption, which is a key component of contract farming (Abdulai and Huffman, 2014). Agricultural extension activity has demonstrated to be a treasured source of knowledge for smallholder adoption decisions like contract participation. Chikuni and Kilima (2019) stated that directing resources of government toward strengthening extension deliveries and raising productivity of farmers are effective approaches to inspire farmers to involve in agricultural markets.

Membership of a farmer-based organisation was found to be positive and significantly influence farmers' decision to join a maize contract farming scheme. This result collaborates with results of Lambrecht and Ragasa (2018) from northern Ghana. Indeed, farmers rely on social capital for

access to input, collective selling of food, seed production, savings and credit, input credit as well as contract production. Also, members of the farmer group are likely to be aware of CF opportunities in the community and to do so sooner. From the study, contracting firms or individual entrepreneurs prefer to work with farmer-based groups than work with farmers individually. This supports the idea that networking facilitates the flow of information, which improves technological adoption. Farmer group participation is key in CF since the contract firm not only saves money on transactions, but also negotiates better contract terms with the group than with individual farmers (Soullier and Moustier, 2018).

Table 5.4 further showed that hired labour showed a significant and positive correlation with involvement in CF and is a predictor of CF participation. This implies that maize farmers who use hired labour on their maize fields were more likely to participate in CF. Studies that have analysed the effects of the labour market show that contracting increases the amount of labour needed for harvesting, postharvest handling, and farm production (Benali et al., 2018; Meemken and Bellemare, 2020). Ruml and Qaim (2021) found that the use of labour-saving technologies in Ghana is linked to contracting, which significantly lowers the labour intensity of agriculture.

The coefficient of location dummy denoted as 1 if farmer lived in the Upper West Region (UWR) and 0 if farmer lived in the Northern Region, was different from zero at the 1 percent statistically significant level. Farmers in the UWR tend to participate more in maize CF than those in Northern Region. This is expected, given that maize CF schemes are more prevalent in the UWR than in the Northern Region.

At predetermined locations, contract businesses and individual business owners pick up or purchase maize from contract farmers. Local traders buy at the farm gate concurrently. Due to their distance from the market places, the farmers choose to sell at the farm gate. The results

indicate that farmers' participation in CF is negatively influenced by their distance from the market. The sign of the coefficient confirms that as farmers get farther away from the market centers—one additional kilometer—the probability of taking part in CF reduces (Table 5.4). This outcome is consistent with studies by Danso-Abbeam *et al.* (2022), Ganewo *et al.* (2022), Sisay (2022) and Gemechu *et al.* (2017) but opposes the findings of Bezabeh *et al.* (2020). This is most likely because the distance to the farm discourages farming operations because it takes a lot of energy to go there (Danso-Abbeam *et al.*, 2022). However, this is at odds with the results of Dubbert (2019), who found that if distance from a cashew farmer's homestead to their farm increases, the farmer's likelihood of engaging in CF increases.

It was discovered also that farmers' access to agricultural markets had significantly and positively influenced the decision to join maize CF. Availability of and easy access to agricultural markets plays significant role in lowering farmers' costs of transaction. If farmers are able to access agricultural market, there is a good chance that they will not partake in maize CF. This finding insinuates that maize farmers in the study area engage in CF not because they lack access to markets, but because they may lack the financial means to obtain the necessary inputs for production. This was unexpected, as access to markets was expected to reduce the probability of farmers making the decision to join CF. CF often provides smallholder farmers with access to essential inputs such as seeds, fertilizers, and pesticides, which they might otherwise be unable to afford. This arrangement enables them to enhance productivity and secure better yields. For instance, a study published in The Journal of Development Studies highlights that input-providing contracts can significantly improve smallholder farmers' access to necessary resources, thereby increasing their agricultural output and income (Ruml *et al.*, 2021).

Mobile phone ownership was also found to exert a negative effect on the decision of a farmer to engage in maize CF. Characteristically, owning a mobile phone was expected to improve access to information and reduce costs of transaction such as transportation, search cost, and other costs relating to marketing. This can make market participation decisions easier, and as a result, farmers would be less motivated to join CF schemes. This finding is supported by Dubbert (2019), who remarked that cashew growers in Ghana who possessed a cellphone were likely not to engage in contract farming.

The identification of instrument, nature of road network (1 = all weather road and 0 = not all-weather road), positively affects contract involvement significantly at a 1 percent significant level. The *chi-square test* involving contract farming participation and nature of road network was statistically significant at 1%, indicating that the instrument nature of road network differs significantly from zero in the first stage. This suggests that the nature of road network was found to be a key determinant of decisions of the farmers to join CF in rural northern Ghana. Table 5.4 shows that the nature of road network is positively connected with the decision to partake in CF, implying that families with a better road network (all weather roads) have a better chance of joining CF than their counterparts with a terrible road network (not all-weather roads). This result is supported by findings of Mercy *et al*. (2013) who noted that status of road was positively correlated with farmers' decision to join CF in Kenya. However, this finding is not consistent with the *aprior* expectation as it was expected that farmers living in areas where road networks are not good were likely to make a positive decision to participate in CF. According to Kabunga *et al.* (2012), the selection equation's aim is not to precisely explain participation but rather to predict unobserved heterogeneity that might distort the impact of the outcome equations. For this reason, instruments

such as the nature of the road network were included in the selection equation rather than the outcome equations to account for any unobserved heterogeneity.

5.3 Determinants of maize yield and net farm income of farm households

The factors that influence the outcome variables in the outcome equation are listed in Table 5.5. In order to rule out any changes in the features of output level, pricing, and variable input costs, net farm income from maize production per kilogram was specifically used to provide an indicator of income effect (Ma and Abdulai, 2016). The correlation coefficients (ρ0 and ρ1) between the error terms in the selection equation and outcome equations are shown in the table. At the one percent statistical level, the correlation coefficient for contract farmers (ρ1) was negative and significant, implying that farmers choose to participate in CF. This implies that unobserved factors influencing contract participation decisions also have effect on farm performance (yield per acre and net farm income). If non-contract farmers opt to partake in maize CF scheme, the decision to join CF may have the same performance impact. The negative sign denotes a positive selection bias, meaning that maize farmers who above-average yields were likely to join contract farming. This is consistent with literature on impact evaluation studies (Manda et al., 2017; Nonvide, 2018; Manda et al., 2019).

Table 5.5: Drivers of maize yield and net return maize farm households

	Maize yield		Net farm income	
	CF	Non-CF	CF	Non-CF
	Coefficient	Coefficient	Coefficient	Coefficient
Sex	-0.106	-0.320	1.935**	0.902**
	(0.114)	(0.193)	(0.823)	(0.947)
Age	0.296	-0.147	2.371**	-0.160
	(0.238)	(0.175)	(1.110)	(0.800)
Education	0.099**	0.004	0.293	0.146
	(0.043)	(0.034)	(0.252)	(0.158)
household size	0.075	-0.194**	-0.628	-0.473***
	(0.117)	(0.077)	(0.576)	(0.383)
dependents	0.260***	0.238***	0.151***	-0.033
	(0.904)	(0.069)	(0.372)	(0.306)
Farm size	-0.108	0.054	0.480	2.011***
	(0.082)	(0.091)	(0.493)	(0.350)
Experience	-0.014	0.079	0.485	-0.014
	(0.071)	(0.081)	(0.451)	(0.385)
Extension access	0.599***	0.307*	0.039***	-0.063
	(0.168)	(0.170)	(0.719)	(0.713)
Farm group	0.237*	1.134	-0.140	4.344***
	(0.125)	(0.451)	(0.749)	(0.878)
Hired labour	-0.349***	-0.147	-1.603***	0.046
	(0.205)	(0.101)	(0.518)	(0.401)
Market access	-0.160*	0.075	-0.971**	0.875**
	(0.140)	(0.084)	(0.631)	(0.392)
Mobile phone ownership	-0.074	-0.236	0.940**	-0.845
	(0.123)	(0.159)	(0.685)	(0.168)
Market distance	0.200*	0.041	0.645	-0.161
	(0.123)	(0.062)	0.441	(0.285)
Location	0.154	0.566***	-0.457	1.412***
	(0.171)	(0.130)	(0.825)	(0.541)
Constant	5.504***	6.740***	-5.942	1.428
	(3.439)	(0.626)	(3.635)	(2.688)
$\rho 0$	0.286		-0.713	
	(0.322)		(0.459)	
$\rho 1$	-0.630**		0.377***	
	(0.136)		(0.410)	
Wald χ^2statistic	4.18**		4.56**	

Note: ** 10% significance level; **5% significance level; ***1% significance level.*
Source: *field survey, 2020*

Table 5.5 includes variables that have a significant impact on farm performance (maize yield per acre and net farm income) in both CF and non-CF situations. While education, number of dependents, contact with extension services, farmer group membership and market distance all contributed to increase maize yield in contracted maize farms, household size, number of dependents, extension, and location variable all contributed significantly to maize yield in non-contracted maize farms. Similarly, among contract farmers, the factors that determined maize net farm income were sex of farmer, farmer age, number of dependents, access to extension, hired labour, market access and mobile phone ownership. In non-contracted farms, sex, household size, number of dependents, maize farm size, farmer group membership, access to market and location all have a significant role in maize net farm income of farmers in the area. Variables with the same sign have the same impact on the outcome variables, while those with different signs have different impacts on the two outcome variables of the two farmer groups.

Sex of farmer was not a significant determinant of yield in both CF and non-CF equations. However, sex of farmer had positive significant effect on net farm income of both contract and non-contract farmers, suggesting male CF farmers achieved better net farm income than female farmers in the area. The significance in the net farm income equation could be expounded by the fact that male farmers are likely to put agricultural specialists' advice into practice than female farmers (Akudugu *et al.,* 2012). This result shows consistency with Hsieh and Luh (2022) who found that farm operators who were principally males tend to have improve farm performance (sales revenue) among rice farm households in Taiwan.

For both CF and non-CF farmers, the age of the farmer had no discernible impact on maize yield, suggesting that age had no bearing on maize output in the study area. Conversely, for CF farmers, the age of the farmer was found to be a significant determinant of maize net farm income, whereas

it was not significant for non-CF farmers. At the five percent significance level, the age variable had shown to be positive and significant, suggesting that a one-year increase in a farmer's age enhances the net farm revenue of the maize farm. Since younger farmers tend to be better educated and capable of understanding new and improved technology, it was predicted that they would report higher net farm income than older farmers. Similar result was found by Bidzakin *et al.* (2019) from Ghana and Chaovanapoonphol and Somyana (2020) from Lao People's Democratic Republic (Lao PDR). However, as farmers become older, they become more experienced, more productive and better negotiators when selling crop harvest as compared to younger farmers. However, the result contradicts Adabe *et al.* (2019) from Togo, who found that, higher revenue and net profit was adversely affected by farmer's age.

Also, education measured in years of schooling by farmers exerted a positive effect on maize yield among contract farmers and was statistically significant at 5 percent. The positive and significant coefficients exhibited by education implies that the benefits of participation in CF in terms of yields may be increased by having solid knowledge and comprehension of CF. This result supports the results of Abdulai and Huffman (2014) from Ghana. Chaovanapoonphol and Somyana (2020) also found that household head age was a significant driver of production efficiency among maize CF farmers. Among the non-contract farmers, educational level was not statistically different from zero, implying that, education does not influence maize yield in the area among this type of farmers. Similarly, education was also not an important determinants t of maize net farm income among both CF and non-CF farmers.

Maize yield and net farm income of contract farmers, household size was not a significant driver of yield and net farm income, indicating that household size which was a proxy for labour availability is not important in maize farming among CF farmers in the study area. However,

household size was significant on yield and net farm income of farmers who did not join CF and had a negative coefficients sign. These findings are against *apriori* expectations. The study posited that, large farm households would achieve higher net farm income through higher yield through labour availability, since household size is a proxy for labour availability. As a result, a non-contract farmer with a large number of household members received a lower net farm income from maize farming than those with small number of household members. Bidzakin *et al.* (2019) found comparable results among rice CF and non-CF farmers from Ghana. They noted that this may be due to the fact that notwithstanding the reasonably large family size, many of the members' time is spend on other activities including alcoholism, schooling among others and accordingly are not freely available to be used as labour.

For both CF and non-CF farmers, the number of dependent in the household had a significant and positive effect on maize yield. Because a household may be conscious of its obligations in terms of catering for household members particularly the dependents, it invests more in farms. The statistical levels of significance for both CF and non-CF farmers was at 1 percent. The implication is that farmers with many dependents got higher yields in this study. A probable reason to this could be that farmers with many dependents have extra people to feed, motivating them to work harder to enhance their maize production. On the other hand, the variable number of dependents was only a key determinant of maize net farm income among farmers who engaged in CF. The relationship was positive, contrary to expectations, implying that a CF farmer with more dependents gets the best net farm income from maize farming. The insignificance of the variable dependents on net farm income among the non-contracted farmers means that it has no bearing on maize net farm income for a farmer that produce maize under no contract.

Furthermore, while maize farm size was not a significant determinant of CF farmers' yield, it was a significant determinant of maize yield among the non-CF farmers. Large maize farms produce higher yield than smaller maize farms among the non-CF farmers. To put it in another way, increasing the area of a maize farm leads to higher yields for non-CF farmers. The lack of significance of maize farm size among the CF farmers suggests that increasing maize farm size does not enhance output appreciably for this type of farmers. It could also be that contracted farmers already cultivate large farm size because of the contracts. Farm size was also statistically insignificant in the net farm income equation among CF farmers, indicating that land allocated for maize farming has no effect on net farm income of CF farmers. However, maize farm size significantly influences net farm income of farmers who produce under no contract, suggesting that a non-CF farmer who increase his maize farm size by one unit got higher net farm income. A result supported by Azumah *et al.* (2016) who reported positive farm size effect on income among smallholder CF and non-CF farmers in the northern part of Ghana. Nevertheless, this result opposes Bidzakin *et al.* (2019) as they found farm size was negatively correlated rice yield among contracted rice farmers in Ghana.

Results further showed that extension contact positively influence maize yield and by extension, net farm income among contract farmers. This is shown by the 1% level of significance and the positive *a prior* expectation of the extension contact variable. This means that, a farmer producing maize under a contract agreement had more contact with extension agents and hece abides by the good agronomic practices (GAP) required for achieving maximum yield of maize in the study area. Based on contract obligations, comprising of relatively high agreed produce price per kilo, maize contract farmers attract high net income from sale of harvested produce. In the case of non-CF farmers, contact with extension agents had a positive effect on yield, implying that a farmer

producing maize without a contract but with more contact with extension agents earns a higher yield than a non-contracted farmer with less contact with extension agents. However, contact with extension agents exhibited no significant relationship with net farm income among the non-CF farmers.

Similarly, afarmer's membership to farmer based-group had a significant and positive effect on maize yield at 10 percent significant level but weakly associated net farm income among CF farmers. This implies that farmers who produce maize under contract and were members of farmer-based organisations got higher yields per acre than those who were not members but produce under contract. Membership in farmer groups reinforces farmer confidence and social capital. Smallholder farmer groups in certain situations are employing CF, including the various maize CF in Northern Ghana, some of which were formed by these farmer groups (Lambrecht and Ragasar, 2018). Farmer-based-organizations help farmers advance their technical understanding of innovative and better agricultural techniques. From this point on, farmers learn how to use inputs efficiently in order to maximise yield. Also, among the non-contract farmers, membership of farmer-based organisation did not differ from zero significantly, implying that it did not contribute to the yield of non-CF farmers. However, the variable significantly influence net farm income positively at 1 percent significant level, suggesting that non-contract farmers who were members of farmer groups improve their net farm incomes than their counterparts who did not hold any allegiance with farmer based organisation.

Engagement of hired labour tends to have a negative but significant effects on maize yield and net farm income for contract farmers, but had no influence on non-contract farmers. To the extent that non-CF farmers are more credit constrained compared to CF farmers, the negative significant effect on CF farmers may be due to the fact that income accruing from farming is not employed to

secure inputs including fertiliser and labour to enhance productivity. This may be due to provision of chemicals including those for weed control which is one activity that use labour intensively for maize cultivation in northern Ghana. This result disagrees with other studies (Meemken and Bellemare, 2020; Benali *et al.*, 2018) which suggest that CF leads to additional labour requirement particularly at production stage, harvesting as well as postharvest activities. Among the non-contract farmers, the influence of hired labour on maize yield and net farm income was not significant even at 10 percent statistical level, signifying that hired labour do not determine farm performance among the non-contract farmers in the area.

The variable access to input market had a negative impact on maize yields and net farm income for farmers that produce maize under contract. This finding is contrary to what was expected as it reduces both yield and net farm income for contract farmers who have access to the input market. Farmers can increase their farm output through access to the input markets. The negative association highlights the significance of proper use of inputs. Farmers who participated in CF and have access to input market could gain more input to supplement what is gotten from contract farming arrangement that could result in excess input use. This emphasizes the importance of training on the use of inputs that increase productivity. In contrast, access to input market was not a significant determinant of maize yield but significantly influences net farm income positively at 5 percent significance level among non-CF farmers. These results are contrary to apriori expectation as the study posit that if contract farmers already receive inputs from the companies then input market access may not significantly influence their yields. However, it could be significant for non-contracted farmers.

Likewise, ownership of mobile telephones was significantly different from zero in influencing net farm income of CF farmers. While mobile telephony holdings are directly associated with net farm

income, it was not significantly associated with yield of maize farming households. Contract farmers that possess a mobile telephone have higher net farm income from their maize farming while those without mobile phones got reduced net farm income among the CF farmers. The variable mobile phone ownership lowers transaction costs and improve net farm income. But this variable was insignificant in the non-CF equations, suggesting that the variable do not contribute significantly to the two outcomes (yield and net farm income) for non-CF farmers.

Distances was measured in kilometres to the nearest major market in the study area. Distance to the major market centre significantly affects maize yield at 10 percent significant level among CF farmers. Unexpectedly, as the distance required to get to the nearby major market centre increases, the yield from maize per acre increases, holding all other variables constant. Actually, this can determine the market's supply of maize. This occasionally has to do with the condition of the roads as well, as farmers require trucks to deliver their maize to markets. This may be explained by the fact that CF companies employ farmers in rural areas and in areas far from major market centres, both of which have inadequate road networks. This implies farmers do not have to worry about marketing of their produce as they have their maize bulk at the communities by the contract companies. Akumu *et al.* (2020) noted that it is more convenient for CF firms to procure crop output in bulk at selected places than buying from farm gate from individual farmers, which may earn extra transactional costs. On the contrary, distance to the closest market was not significant among non-contract farmers in explaining differences in maize yield and net farm income.

The findings also show that among the non-contract farmers in this study, location-fixed effects might play an important role in interpreting variations in maize yield and net farm income. Specifically, better yields and net farm income are typically observed among farmers who lived in the Upper West Region and produce maize without a contract, whereas lower yields and net farm

income are recorded among non-CF farmers in the Northern Region. Regarding contract farming, the location-fixed effect typically does not account for the differences in net farm income and maize productivity across contract farmers.

5.4 Impact of CF on Maize Yield and Net Farm Income

Table 5.6 demonstrates the effect of CF on maize smallholder farmers' yield and net farm income in the study area. The study used the ESR model to estimate the impact of CF on the average treatment effect on the entire population (ATE), the treated group (ATET), and the untreated group (ATENT), while accounting for both observable and unobservable factors.

Table 5.6: Impact of CF on maize yield and net farm income

Sub-sample	Decision stage		Treatment effect
	Benefited	Did not benefit	
Maize yield			
Contract farmers	(a) 7.139	(c) 6.659	ATT = 0.480***
Non-contract farmers	(d) 6.926	(b) 6.050	ATU = 0.876***
Heterogeneity effects	BH1 = 0.213	BH2 = 0.609	TH = - 0.396***
Net return			
Contract farmers	(i) 6.759	(iii) 5.332	ATT = 1.427***
Non-contract farmers	(iv) 6.294	(ii) 5.364	ATU = 0.93***
Heterogeneity effects	BH1 = 0.465	BH2 = 1.968	TH = -1.503***

Source: Field survey, (2020).

Findings indicate that CF significantly improves farm performance, increasing maize yield and maize farm revenue margins by 21.3 percent and 46.5 percent respectively. However, while making policy suggestions, it is crucial to identify the gaps in performance between CF farmers in

their current status and their hypothetical position if they had not taken part in CF (ATET). The evidence presented in Table 5.6 indicates that CF farmers have achieved significant economic benefits, whereas non-participants in CF may have potentially gained huge profits had they participated. CF farmers had a significant increase in both crop yield and net farm revenue, namely by around 48 percent and 143 percent respectively, compared to what they would have earned without participating in CF.

Those who did not participate in CF would have experienced a yield increase of 87.6 percent. Furthermore, the net farm revenue of non-CF farmers would have experienced a 93 percent increase if they had taken part in CF. Consequently; farmers who chose not to participate in CF had a smaller degree of economic benefit compared to what they would have gained if they had chosen to join. Additionally, the results indicate a negative and significant Transitional Heterogeneity (TH) impact (0.396), suggesting that non-contract farmers were more affected by CF than their CF counterparts. Non-CF farmers would have produce 39.6 percent more than CF farmers, if they (non-CF participants) actually participated in CF. CF participation is projected to have a positive influence on maize yield because it helps farmers boost maize productivity by providing quality inputs, extension services and market, hence promoting maize production. The findings are consistent with other studies that show a positive relationship between CF and farm performance in the study area (Ayamg, 2023; Danso-Abbeam *et al.*, 2022; Bidzakin *et al.*, 2019; Ragasa *et al.*, 2018). As mentioned earlier, as part of their contractual agreements, contracting firms provide farmers credit in the form of inputs to help them with the production processes. This partnership make scarce inputs such as improved seeds and fertilisers, available to farmers, ensuing in increased in yields.

Likewise, the estimated TH showed a negative and significant TH (-1.968) implying that the impact of CF on net farm revenue was also greater among non-contract farmers than their CF counterparts. This research highlights the fact that CF is a useful instrument for raising the net farm income of maize farmers. As long as it is tailored to the specific environment, policymakers, the government, and rural development organisations should consider using CF as an alternative to current rural development strategies. One reason for this profitability of CF is the fact that CF farmers do not have to search and bargain with buyers which reduced their cost of transaction. The CF firm usually organizes their transportation for their crop at the farm gate. This result is similar to Liang *et al.* (2023) in China, Danso-Abbeam *et al.* (2022) from Ghana, Bezabeh et al. (2020) in Ethiopia and Bidzakin *et al.* (2019) from Ghana. Ragasa *et al.* (2018) did a similar work in the study area but found that though CF contributes to productivity increase and adoption of new technologies, it was noted that this did not result to higher profits because production costs were relatively high under maize CF scheme as compare to non-CF farmers.

5.5 Summary of chapter

In the light of the challenges subsistence farmers have in growing and selling their maize, particularly in northern Ghana, maize CF has gained widespread recognition as a means of integrating them into maize value chains. By analysing the factors that influence maize farmers' decisions to participate in CF and the consequences of CF on metrics of farm performance, such as net farm income and farm yield, this chapter advances the conversation. The performance metrics of CF and non-CF farmers were compared simply, and the results revealed some significant differences between the two groups. An ESR model that accounts for selection bias and the endogeneity of observable and unobserved features was calculated because the average

differences did not account for the confounding effects of other human qualities such as risk preferences, motivation, or agricultural expertise.

The empirical findings demonstrate that contract farming improves maize yield and net farm income of maize farmers in northern Ghana. According to the estimation results, there is a significant and positive relationship between CF and net farm revenue and maize yields. CF farmers got maize higher yield and net farm income per acre than non-CF farmers. While CF farmers increased their maize productivity by 48 percent, non-CF farmers would increase their maize yield by about 88 percent had they participated in CF. In the same way, the effect of CF on the percentage increase in net farm income was positive, implying that CF contribution to the profitability of maize farming was positive for both CF farmers non-CF farmers had they participated.

CHAPTER SIX

FACTORS INFLUENCING FARMERS' MARKET PARTICIPATION AND THE EXTENT OF PARTICIPATION IN NORTHERN GHANA

6.0 Introduction

As previously stated in the literature review in this study, several studies have acknowledged the drivers of smallholder market involvement with a strong emphasis on the output side of the market. Because smallholder farmers' market involvement encourages agricultural and rural economic growth, the goal of this chapter is to assess the key drivers of smallholder decision to participate in the market and the extent of participation in the market. This chapter is divided into four major sections. The first section presents the descriptive statistics of the variables used in the estimation (section 6.1). Section 6.2, examines smallholder maize production market behaviour in the study area. In Section 6.3, the main factors influencing household market participation and the extent of participation are examined, and lastly Section 6.4 provides a summary of the chapter.

6.1 Descriptive statistics of variables used in the econometrics estimation

Different descriptive statistical measures, such as frequency, mean and percentage values of variables employed in the model are presented in Table 6.1 and 6.2 respectively based on institutional, agricultural, and demographic features of the sample farmers. Group comparisons between market participants and non-participants were calculated using the t-test for continuous variables and the Chi2-test for dummy variables, as shown in Tables 6.1 and 6.2. According to the survey's results, of the 420 farmers who planted maize, 233 participated in the market, while 187 did not during the 2019–20 growing season.

The average age of individuals who participated in the maize market was roughly 41 years old, whereas the average age of those who did not was approximately 38 years old, based on the survey

data displayed in Table 6.1. This suggests that compared to younger farmers, elderly farmers engaged in the maize market at a greater rate. The study results showed that, on average, those who participated in the maize market had five years of education, while those who did not had an education level of about three years. Consequently, the education level was shown to be statistically significant at 1%, suggesting that the mean education level of market participants was greater than that of non-participants. Those that took part in the maize market had an average household size of ten, while those who did not was nine. A typical farmer in the area is being dependent (children less than 15 years and aged) on by five people on the average with non-market participants having seven people as dependents and four people depend on farmers who were market participants. The sample t-test indicates a significant variance between dependents and farmer market participation.

Farmers in the sample possessed an average of 13 acres of arable land, with market participants and non-participants possessing 16 and 9 acres, respectively. The typical amount of land set aside for maize production was four acres in this area. The difference between market participants (3.3 acres) and non-market participants (4.7 acres) in terms of average maize land allocation was statistically significant at 1 percent. A growing farm size enables farmers to produce surpluses, which encourages greater market participation (Asfaw *et al.*, 2022; Abadega, 2021; Hagos *et al.*, 2020). Participants in the maize market had an average of 9 years of agricultural experience, compared to an average of 11 years for non-participants, as shown in Table 6.1. Farmers on average had to travel 4.0 kilometers (km) to the nearby market to sell their maize, with a standard deviation of 0.108. Farmers who participated in the market traveled less distance (3.2km) to get there, whereas farmers who did not engage in the market had to travel 4.4km to market their maize harvest at the closest market. The mean distance from the closest market between market

participants and non-participants was found to be substantially different at the 1 percent significance level. There was also a statistical difference between market participants and non-market participants at 1 percent significant level and average price receive per a bag (50kg) of maize was GHS 61.9.

Table 6.1: Demographic and farm characteristics of continuous variables

Variable	**Pooled (420)** **Mean (std. dev.)**	**Market participants (233)** **Mean (std. dev.)**	**Non-market participants (187)** **Mean (std. dev.)**	***t*-value**
Age of farmer	39.6 (0.583)	40.7 (0.859)	38. 4 (0.748)	-1.9674**
Education	4.0 (0.259)	4.5 (0.360)	3.3 (0.365)	-2.2748**
Household size	9.7 (0.273)	10.2 (0.364)	9.0 (0.408)	-2.2760**
children less 15 years	5.0 (0.267)	3.6 (0.340)	6.7 (0.391)	6.1316***
Total arable land	12.9 (0.599)	16.3 (.922)	8.5 (0.557)	-6.8201***
Maize farm-size	3.9 (0.278)	3.3 (0.325)	4.7 (0.470)	2.4488**
Quantity of maize	42.6 (4.590)	37.6 (5.768)	48.9 (7.384)	1.2310
Farmer experience	10.1 (0.377)	9.1 (0.491)	11.3 (0.574)	2.8954***
Market distance	4.0 (0.108)	3.7 (0.126)	4.4 (0.183)	3.4026***
Market price of maize	61.9 (7.359)	99.2 (12.544)	15.5 (2.922)	-5.8726***

*Field survey, 2020, ***, **, * represent respectively 1%, 5% and 10% significance level*

The summary statistics for the dummy variables utilised in the study are displayed in Table 6.2. According to the Table above, there were 217 male farmers who participated in the maize market

and 164 who did not. However, there were 16 female farmers who took part and 23 who did not. In terms of marital status, 138 monogamous families engaged in the maize market, whereas 171 households remained monogamous and refrained from doing so. In contrast, there were around 49 polygamous families among the non-market participants, while the remaining 62 market participants also engaged in polygamy. On the subject of participation in government projects, only 26 of the farmers who took part in any government project in the study area also took part in the market, while 54 farmers who took part in projects in their communities did not do the same. In contrast, none of the 207 market participants and 133 non-market participants in the research region were associated with any government project. The chi-square test findings showed a substantial correlation between market engagement at a 1 percent level and participation in government initiatives. Similar to this, 146 farmers who live closer to a tarmac road, attended the market, compared to 139 who did not. While 48 and 87 farmers, whose roads lead to a major market centre, respectively participated and did not participate in the market. At 1 percent, the correlation between the variables was considered statistically significant. In addition, 210 market participants had access to inputs, as opposed to 23 others. The remaining 83 farmers who did not participate in the market had no access to inputs, while about 104 non-market participants did. The relationship between access to inputs and market engagement was significant at 1 percent statistical level.

Table 6.2 further depicts that 107 farmers who took part in the market had a positive perception of the fertility of their maize farm, while 126 farmers had a negative opinion. However, 132 non-market participants had a negative perception of the fertility of maize farm and 55 of them had a positive perception of their maize farms.

Table 6.2: Demographic and farm characteristics of dummy variables

Variable		Pooled (420) (%)	Market participants (242) (%)	Non-participants (178) (%)	χ^2 value
Sex	Male	381 (90.71)	217 (51.67)	164 (39.05)	3.6346*
	female	39 (9.29)	16 (3.81)	23 (5.48)	
Marriage	Monogamy	309 (73.57)	171 (40.71)	138 (32.86)	0.0088
	Polygamy	49 (11.67)	62 (14.76)	111 (26.43)	
Government project	Yes	80 (19.05)	26 (6.19)	54 (12.86)	21.1211***
	No	340 (80.95)	207 (49.29)	133 (31.67)	
Land fertility	Fertile	162 (38.57)	107 (25.48)	55 (13.10)	11.9360***
	Not fertile	258 (61.43)	126 (30.00)	132 (31.43)	
Contract farming	Contract	169 (40.24)	98 (23.33)	71 (16.90)	0.7224
	Non-contract	251 (59.76)	135 (32.14)	116 (27.62)	
Market information	Access	233 (55.48)	160 (38.10)	73 (17.38)	36.8786***
	No access	187 (44.52)	73 (17.38)	114 (27.14)	
Nature of road	Tarred	285 (67.86)	146 (34.76)	139 (33.10)	6.4782**
	Not tarred	135 (32.14)	87 (20.71)	48 (11.43)	
Access to inputs	Yes	314 (74.76)	210 (50.00)	104 (24.6)	65.4932***
	No	106 (25.24)	23 (5.48)	83 (19.76)	
Farmer group	Yes	96 (22.86)	64 (15.24)	32 (7.62)	6.3092**
	No	234 (77.14)	169 (40.24)	155 (36.90)	

Note: **, **, *** represent 10%, 5% and 1% significance level respectively*

Source: *Field survey, 2020,*

In terms of how the groups perceived the fertility of their maize farms, the chi-square results demonstrate a significant variation between the market and non-market participants at a 1 percent significance level. In terms of contract farming involvement, the data explains that 135 of market participants were not involve in maize contract farming and 98 market participants were maize

contract farmers. Of the total number of farmers sampled 71 non-market participants were contract farming while the remaining 116 were non-CF farmers. However, the relationship was not significant as shown in the chi-square test.

Moreover, 73 participants lacked access to market data, whereas 160 farmers who had access to it participated in the market. However, just 73 of the non-market participants had access to the information about the market, and 114 of them were still doing so. Access to market knowledge and market involvement were significantly correlated at 1 percent. Of the sample's farmers, 64 are members of farmer organisations and take part in the maize market, whereas 169 are not members of any farmer organisation and do not take part in the maize output market. About 32 of the non-market participants belonged to farmer groups, compared to 155 non-participants who did not. The chi-square test indicates that, at the 1 percent level, there is a statistically significant link between the two categories of farmers' involvement in farmer organisations.

6.2 Farmers' market participation behaviour in northern Ghana

There is no universal metric for determining the extent of commercialisation. Yet, the fraction of output marketed has been employed as a substitute for gauging the extent of commercialisation in many empirical studies (Kelifa *et al.*, 2021; Addisu, 2018; Gutu, 2017; Tadele *et al.*, 2017). As a result, the percentage of maize marketed was used also to calculate the degree of commercialisation in this study. The household commercialisation index, which reflects the percentage value of maize marketed in relation to the overall value of maize output produced was, used to assess farmers' extent of involvement in the output market. The statistics of maize farmers' market participation are shown in Table 6.3. In the 2019 production season, 42.38 percent of the sampled maize farmers did not take part in maize output market at all as sellers, while 19.29 percent participated but sold less than 25 percent of maize output in the market as sellers, implying

that these farmers may be living on a complete subsistence basis (Ouedraogo, 2019). About 17 percent of the farmers engaged in the maize output market sold between 25 – 49 percent of maize produced. Similarly, 21 percent sold at least 50 percent of their total maize output.

Table 6.3: Households maize output market participation behaviour

HCI	Number of observations	Percentage in the sample
Zero quantity sold	178	42.38
Less than 25% of quantity sold	81	19.29
25% to less than 50% of quantity sold	73	17.38
50% and above quantity sold	88	20.95
Total	420	100

Field survey, 2020

6.2.1 Commercialisation in terms of maize farm size, contract farming, sex and region

The extent of farmers' involvement in a market was also assessed based on farm size, contract farming arrangement, sex, and region (location), and the results provided in Table 6.4. The commercialisation of agriculture has been a contentious topic of discussion. While some authors have advocated for the effectiveness of smallholder farming (Delgado 1999; Lipton 2006), others have recommended for large-scale, modernised commercial agriculture (Collier and Dercon 2014). While others (eg IFAD 2014; World Bank 2010; *Cotula et al.,* 2009; von Braun and Meinzen-Dick, 2009) advocate for CF agreements as a means of fostering integration between estates and out-growers, others highlight the significance of medium-sized farms and emerging patterns of consolidation (Sitko and Jayne 2014). Being close to the market improves information availability and may make it easier to build relationships with certain purchasers. Food prices may also be

more constant in more remote places, which increases the advantages from sale to market due to lower transportation expenses.

Large farms are often linked with greater market participation since farm households that possess more land are likely to produce past subsistence levels, creating surplus to be sold in the market. On the other hand, small farm households may engage primarily in subsistence farming, restricting their market participation. The results indicate that large farms were more commercialised than small farms. Maize farms with acreages ranging from 1 to 10 acres sold 22.3 percent of total maize production. Farms with acreages ranging from 11 to 20 acres sold 31.4 percent of the entire maize crop. About 44.4 percent of maize produced on farms with a land area of more than 20 acres was sold at the market. The data point to a direct link between maize farm size and maize commercialisation. This lends credence to the notion that bigger farms may be more likely than small farmers to commercialise.

Besides, CF arrangements can raise smallholder farmers' market participation by offering reduced price uncertainty, guaranteed buyers and providing input support. Non-CF farmers may also have different patterns of market engagement condition on their ability to access buyers, transportation, and storage facilities. Table 6.3 also showed that contracted farmers sold considerably more maize in the market than non-CF farmers, based on the type of farmer used as a proxy for CF and non-CF farmers. This could suggests that non-CF farmers were more focused on attaining household food security than the market when compared with CF farmers. This finding is not surprising as results in chapter five of this research revealed that contract farming had a positive effect on maize yield which could result in higher marketable surplus. This could be possibly because CF farmers were able access high quality inputs and also received essential agricultural service from the contracting firm for production. This gave them the chance to gain higher maize output to honour

the contract agreement and still have more marketable surplus to partake in market after household food consumption needs have been met. Another possible reason could be that non-contract farmers obtain low maize output and may be more concern of the food needs of the household than participating in maize output market owing to the low marketable surplus. This may explain why contract farmers have a higher degree of market participation than non-contract farmers.

Table 6.4: Levels of market participation by maize farm size, type of household, sex and region

Variable		Commercialisation index	Std. dev.
Farm size	1 – 10 acres	0.223	0.268
	11 – 20 acres	0.314	0.348
	More than 20 acres	0.444	0.360
Sex of household	Female-headed households	0.148	0.231
	Male-headed households	0.238	0.277
Region	Northern	0.211	0.285
	Upper west	0.246	0.263

Field survey, 2020

The sex of the farmers describes the differences in market participation decisions made by men and women in the household. Sex of the farm household plays a critical role in market participation, as female and male farmers may have different levels of access to land, extension services, credit, and market opportunities. Male farm households often have better access to market because of mobility, cultural norms and power in decision-making, while female farm households very generally face challenges in accessing commercial markets. Male farmers in the study area are expected to have a high-pitched appetite to partake in the market than female farmers as a result of their access to productive resources. Table 6.4 above demonstrates that the proportions of maize hawked by female farmers in the area were lower than the proportions sold by male farmers.

Female farmers sold roughly 14.8 percent of total maize production, while their male counterparts sold roughly 23.8 percent. This suggests that male farm households in the research area were likely to send extra maize to the market than female farmers. Findings of Ouedraogo (2019) in Burkina Faso confirms the role of men in agricultural commercialization as they engage in commercialisation more quickly compared to women. This is also dependent on the local social norms and gendered labour division. Often, men seek to control major sources of household income, while women have responsibility for household food provision. This has led to men taking over production of what was previously a woman's crop when market opportunities of such crop(s) increase.

Geographic factors such as infrastructure, including proximity to markets, road networks, and regional agricultural policies, affect farm household's ability to sell their produce. Farm households in regions that well-connected with better market access are more likely to participate actively in the market, while those in remote areas may face logistical challenges. Maize smallholder farmers in the UWR sold higher proportions of their produce than their counterparts in the northern region. The possible explanation for this variation in market could be explained to be that farmers in the UWR have little choices for diversifying their enterprises, therefore their principal income source is the commercialisation of maize. In the Northern Region rice is seen more as a cash crop than maize. The fact that maize CF schemes are more prevalent in the UWR than the Northern Region could also contribute to this variation because CF farmers obtained more output than non-contract farmers. In the Northern region, rice and soya beans contracting are more popular than maize contract farming. This could explain why households in the UWR are more commercialised in maize production than households in the Northern Region.

6.2.2 Smallholder output and input commercialisation index

According to Table 6.5 and FAO (1989), which is covered in this research's sub-section 3.6.3, maize in the study region has a household commercialisation index of 0.229, making it a subsistence crop (HCI < 25%). This suggests that the commercialisation of the maize crop was still at the subsistence stage, with an average of 23 percent of the total amount produced by smallholder farmers in the area being sold. The crop was more commercialised among farmers who produce under contract where 24.8 percent of the maize produced was marketed compared to 20.2 percent for non-CF farmers. The test statistic (t-test) exhibited significant variations among the two groups of farmers, inferring that CF farmers were likely to sell maize in the market than non-CF farmers. This implies that the influence of CF schemes on the percentage of maize sent to the market for sale. On the extent of subsistence level, about 258 of the sampled maize farmers can be classified as subsistence, 73 were in the transition stage while 89 of them sold 50 percent or more of their maize produced and can be classified as commercial farmers. The Chi^2 test also revealed a statistically significant relationship at the ten percent level. Particularly, the CF farmers dominated in all the three levels of commercialisation where 33.81 percent, 10.48 percent and 15.48 percent farmers were subsistence (0 - <0.25), semi-subsistence (0.25 - < 0.5 and commercial farmers (0.5 – 1) respectively, as compared to non-CF farmers where, 27.62 percent, 6.90 percent and 5.71 percent respectively were subsistence, semi-subsistence and commercial farmers.

Table 6.5: Household commercialisation index

Output commercialisation

Variable	Contract (%)	Non-contract (%)	Total (%)	t-value/χ^2
Mean HCI	0.248	0. 202	0.229	1.6675**
0 – 0.249	116 (33.81)	142 (27.62)	258 (61.43)	8.9208*
0.25 – 0.499	29 (10.48)	44 (6.90)	73 (17.38)	
0.5 – 1	24 (15.48)	65 (5.71)	89 (21.19)	

Input commercialisation index

Variable	Contract	Non-contract	Total (%)	χ^2
Mean ICI	0.551	0.287	0.393	-1.3262
0 – 0.249	143	192	335	1.2836
0.25 – 0.499	6	14	20	
0.5 – 1	17	22	39	

Note: *, **, *** *represent 10%, 5% and 1% significance level respectively*
Source: *Field survey, (2020).*

In terms of inputs, the results showed that although non-contract farmers sold less of their maize harvest, they also utilised fewer inputs that were purchased. Farmers applied about 28.7 percent of the inputs purchased from the market; the other inputs were either locally produced but low-yielding or inputs that had been preserved from the previous year. Due to the use of low-yielding seeds that are preserved, less high-quality inputs are being purchased from the market, which lowers productivity. However, contracted farmers were more commercialised to input market participation than non-contract farmers as 55.1 percent of inputs used on maize farm were purchased from the market. The *Chi*^{2} value indicated in Table 6.5 shows a non-significant relationship between input commercialisation and contract farming in the area.

6.2.2 Commercialisation and farmers' participation in the input market

Table 6.6 shows the degree of maize market involvement and farmer access to input market through the two-commercialisation pathways (CF and non-CF pathways). The table shows that 34.14 percent of CF farmers have access to input market while about 11.24 percent of non-CF farmers gain access to the input market in the area, suggesting that farmers that took the contract farming commercialisation pathway gain easy access to market for inputs. This result shows the influence of contract farming arrangement on access to agricultural input market. Specifically, while roughly 57 percent of non-contract farmers who with less than 25 percent of maize produce sold gain access to input market, 62.5 percent of contract farmers with the same level of maize sold have access to the input market. For farmers who hawked between 25 – 50 percent of maize produced in the market and produce maize under no contract, 86.85 percent of them have access to input market. Similarly, about 96.88 percent of contract farmers who sold between 25 – 50 percent of their maize produce have access to the input market.

Approximately, 94.29 percent of contract farmers with more than 50 percent sales of their maize have access to the input market while the percentage of farmers who gain access to the input market and sold more than 50 percent of their maize produce was estimated at 76.36 percent. These findings suggest that farmers that participated more in the output market have more access to the input market too. Access to input market reduces marketing costs by way of search cost, thereby encouraging smallholder farmers to partake in output market more. Contracted farmers have their inputs delivered to them at their communities of residence which require no search and transportation costs to acquire inputs for production. This could explain why CF farmers' involvement in the market was more than non-CF farmers.

Table 6.6: Intensity of Market Participation and Access to agricultural input market

Access to input market	Quantity of maize sold							
	Contract farmers				Non-contract farmers			
	Less than 25%	25–50%	More than 50%	Total	Less than 25%	25–50%	More than 50%	Total
Market access	57.14	80.85	76.36	34.14	62.50	96.88	94.29	11.24
No market	42.86	19.15	23.64	65.86	37.50	3.13	5.71	88.76
Total	100	100	100	100	100	100	100	100

Field survey, 2020

6.3 Factors affecting maize farmers' decisions to participate in market and degree of participation in market

The factors influencing the proportion of maize supplied to the market and the market involvement of maize producers were analysed using the Cragg double hurdle model. Because interpreting the coefficients in terms of magnitude is meaningless, the marginal effects were estimated and used for the interpretation. Agricultural commercialisation is the process through which farmers become more integrated into various markets such as input markets, food and non-food consumption markets, output markets, and labour markets. However, because the output market is the standard indication for the agricultural commercialisation process, this study focuses primarily on the integration of maize farmers into output markets. As indicated earlier in chapter of this study, the control function approach was use to examine the effect of CF on smallholder farmers market participation. The results from the first stage of the control function approach are detailed

in Table A of the appendix. The findings indicate that the instrumental variable, farmers' awareness of CF, significantly predicts CF participation. Specifically, a 1 percentage point increase in farmers' awareness of CF raises the probability of participating in CF by 1.794 percentage points. The DHM was fitted using 19 explanatory variables, which are displayed in Table 6.7. The first-stage model (hurdle1) estimation demonstrated that thirteen variables — age, level of education, household size, number of dependents, participation in government project, perception of land fertility, CF participation, maize farm size, quantity of maize harvested, nature of road, market distance, access to market, lagged maize market price and FBO membership— affect significantly the decisions of the maize smallholders to engage in the market. However, the second-stage estimation confirmed that six variables— household size, number of dependents, CF participation, market distance and distance to major market — affect significantly the proportion of maize allocated to the market by the maize farmers. The likelihood ratio test of the error term of independence (Chi2 = 116.81; Prob > = 0.0000) was statistically different from zero at the 1 percent significance level, specifying the null hypothesis that the error terms across all independent variables (regressors) of market participation are correlated is rejected. As a result, the alternative hypothesis of mutual dependency has been adopted. The sigma (standard deviation of the error term) of 0.233 was also significant, indicating a good fit for the model. These findings support the use of DHM to evaluate the variables affecting maize farmers' participation in the market. The predicted residual (selection residual) was not significant in both the selection and outcome equations, implying CF participation was not endogenous.

Table 6.7 Estimated results of the Double Hurdle

VARIABLES	Hurdle 1	Hurdle 2
Sex	0.364 (0.294)	0.059 (0.072)
Age	0.023** (0.011)	0.001 (0.003)
Marriage type	0.123 (0.203)	-0.017 (0.062)
Level of education	0.030** (0.015)	-0.003 (0.004)
Household size	-0.089*** (0.030)	-0.020***(0.007)
Dependents	0.049* (0.028)	0.020*** (0.006)
Total area cultivated land	-0.009 (0.013)	0.002 (0.003)
Government project	-0.431* (0.238)	-0.050 (0.060)
Perception on land fertility	0.353** (0.156)	0.005 (0.041)
Contract farming	0.692* (0.369)	-0.240*** (0.089)
Maize farm size	0.203*** (0.066)	0.010 (0.010)
Quantity of maize harvested	-0.014**(0.007)	0.001***(0.001)
Experience	-0.023(0.015)	-0.004(0.004)
Nature of road network	-0.486*(0.248)	-0.080(0.062)
Distance to market	0.225*** (0.042)	0.016*(0.009)
Selection residual	-0.275 (0.225)	0.053 (0.059)
Access to market	0.362* (0.198)	0.062** (0.059)
Lag market price	0.008** (0.003)	-0.000 (0.000)
Farmer group membership	6.642*** (0.524)	0.005 (0.105)
Constant	-1.761*** (0.507)	0.486*** (0.120)
Observations	420	420
Log likelihood	-110.33763	
Wald chi2(19)	655.13***	
Sigma	0.233***(0.016)	

Note: *Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*
Source: *Field work, 2020,*

At a significance level of 5 percent, age of a farmer positively connected with the likelihood of taking part in the maize output market. This implies that an increase in farmer's age results in an

increase in the probability that the farmers will participate in the market by 2.3 percent, all things being equal. Older farmers were identified as having the most expertise in growing maize due to their years of farming experience. This observation aligns with Shewaye *et al.* (2015) findings in Ethiopia. Adzawla *et al.* (2022) also pointed out that though farm output is harvested by household members, the decision to participate in market depends on older members or family heads who takes the decision on market participation and the quantity to be sold in the market. On the other hand, Negasa et al., (2020) noted that older farmers may farm for a living rather than for commercial purposes, which lowers their market involvement.

Educational level of the farmer was positive and significant at 5 percent, suggesting that higher educational levels increase the likelihood of market participation. Higher education levels significantly increase the likelihood of market participation, highlighting the importance of human capital in accessing markets and understanding the requirements of the market. The estimated marginal impact shows that, at a 5 percent significant level, the probability that a farmer decides to engage in the market increased by 3 percent for every additional year of education attained, *all other factors staying the same*. This outcome is in line with previous research by Yaynabeba and Tewodros, 2014; Yalew, 2016; and Haile *et al.*, (2022).

As expected, household size had a negative and significant impact on a farmer's decision to participate in the market at a 1 percent significance level (Table 6.7). Therefore, *all other factors being equal*, the likelihood that a farmer decides to take part in the maize output market decreased by 8.9 percent for every additional member. The implication of the negative sign could be that while larger households may have more labour available, they also have more mouths to feed, which could reduce market participation and hence volume of marketable surplus within a household. This aligns with Dangia *et al.* (2019) who indicated that a larger household size lowers

the amount of marketed surplus generated due to increased household food consumption requirements, which influences the decision to take part in the market. Nonetheless, other research indicates that the decision to engage in the output market was shown to be positively correlated with household size (Mirie and Zemedu, 2018; Kelifa *et al.*, 2021; Tadie and Lemma, 2018).

Unexpectedly, there was a notable, albeit direct, correlation between the number of people living as dependents in the family and farmer's decision to engage in the market. The positive sign suggests that as the number of dependents increases in a household, the probability that a farmer will make a decision to participate in the market increases by 4.9 percent assuming the other variables remain the same. This finding support that of Berhanu *et al.* (2010), who postulated that the number of dependents including children under the age of six in a household has a negative effect on decision to partake in the market. They argued that there is competition between the amount of food needed for the market and the amount needed for household needs, but their finding was not significant. On the other hand, among Ugandan smallholder dairy producers, Balirwa and Waholi (2019) observed a positive association between the variable dependents (six years and younger) and farmer's market participation decisions.

Participation in government agricultural projects was negative and significant at 10 percent statistical level, indicating that participation in government projects decreases the likelihood of market participation. This implies that farmers' decisions about market participation were significantly impacted negatively by their involvement in government projects or programmes. This could mean that government initiatives act as a deterrent to smallholder farmers' maize market participation. When the other variables in the model remain the same, the marginal effect demonstrates that a farmer's decision to participate in the market declines by 43.1 percent if the farmer took part in a government project in the area. This was unexpected as participation in

government projects allows smallholders to be armed with needed skills, methods and knowledge in marketing to add value to their maize harvest (Zakari *et al.*, 2023).

As expected, farmers' perception on the fertility of maize farm has a positive and statistically significant association with the decision to participate in the market. Smallholder farmers who have positive view of their soil fertility may develop a market-oriented mindset, seeking to optimize their production for sale rather than consumption. This orientation can lead to better engagement with markets, including understanding market demands, quality standards and pricing. Muriithi and Matz (2014) discovered that land quality was statistically significant and adversely associated with market participation. However, perception of poor soil fertility may lead to a conservative approach, where farmers avoid investing heavily in production inputs due to the risk of low returns. Consequently, they may produce mainly for subsistence rather than for sale, limiting their participation in output market.

The variable CF participation had a positive and significant effect on farmers' decision to participate in the market, suggesting that contract farming increases the likelihood of market participation. CF agreement often provide smallholder farmers with a guaranteed market for their maize produce. This assurance can be a strong motivator for farmers to participate in the market, as they are less concerned about finding buyers or dealing with price fluctuations. Knowing that they have a buyer can also encourage farmers to produce more marketable surplus. Also, as discussed in chapter four of this study, CF often include provision for inputs such as fertilisers, seeds and pesticides as well as technical support and training. This can enhance maize productivity and improve the quality of maize produce. For smallholders who lack access to these resources, the availability through contracts can be crucial factor in deciding to participate in the maize market.

At a 1 percent level of significance, maize farm size had a positive and significant impact on farmers' decision to engage in the maize output market. Keeping all other variables constant, the positive sign shows that increasing maize farm size increases the likelihood of participation in the market. This result shows that farmers who allocate more additional acreage of land through whatever means (i.e., from self-owned, rented-in, or shared-in land) increase their chances of participating in the maize output market. Several researches found comparable results (Yaynabeba and Tewodros, 2013; Shewaye, 2015; Yalew, 2016; Addisu, 2018; Leta, 2018; Degefa et al., 2022; Addisu, 2018).

The variable quantity of maize harvested had a negative and significant influence on the farmers' decision to participate in the market, indicating that larger harvests reduce the likelihood of market participation. The possible reason for this negative sign could as a results of the abundance of maize harvested in the area. When there is abundant maize harvest, the market can be become saturated. The increase in supply lead to lower prices, which reduces potential profits for farmers. If the market price falls below the cost of production or is not sufficient to provide a good return, farmers may be discouraged from selling their maize in the market. More so, when many farmers have a large quantity of maize to sell, they may have little bargaining power with buyers, who can take advantage of the surplus to drive down price. This lack of negotiating can make market participation less appealing.

Against the *a priori* expectations, the farmer's decision to take part in the market is negatively correlated with the quality of the road leading to the closest major market (proxied as 1 = road network motorable roads and 0 = road network not motorable). According to the marginal effect calculated, farmers with motorable road network are 48.6 percent less likelihood to take part in the market compared those without motorable road network. This finding is against Mekonnen and

Alamirew (2017) who result shows that farmers in villages with adequate road access had a 2 percent higher probability of partaking in the agricultural market than farmers in villages with poor access all-weather roads. This could be due to increase competition among farmers. Proximity to good roads often means easier access to markets, attracting many farmers and traders. This could lead to increased competition, potentially lowering prices and profits. It could also be because of middlemen as good road can attract more middlemen, who offer lower prices to farmers. the presence of these intermediaries can reduce farmers' bargaining power, making market participation less appealing.

Consistent with expectation, the distance in kilometres (Km) from the nearest market was observed to have a positive but significant influence on participation in maize market at the 1 percent significance level. The marginal effect states that for every extra km that distances you from the closest market, the likelihood of market engagement improve by 22.5 percent. Farmers located far from local markets may have access to diverse and potentially more lucrative markets. This distant markets may offer better prices or demand a specific products, encouraging farmers to participate and tap into customer bases. A positive impact was found by Akrong *et al.* (2021) in a study conducted in Ghana among mango farmers. However, this finding is against the findings of Dangia *et al.* (2019), who noticed that a maize producer's decision to engage in the market is negatively and significantly impacted by the distance to the market, which is only a few minutes away from their homestead. Several other studies have found negative association existing between decisions of farmers to engage in market and distance to the closest market (Leta, 2018; Tadele *et al.*, 2017). At a 1 percent significance level, it was observed that farmers' decisions to participate in maize market were positively and significantly motivated by access to markets. Agreeing to the marginal effect, there is a 36.2 percent chance, *ceteris paribus*, that farmers will participate in the marketing

of maize if they have access to market. This suggested that in order for farmers to make the best choices, they must be facilitated to access markets and be treated fairly when it comes to prices. Farmers require knowledge about output pricing in order to make the best selection about the variety maize to produce and sell at the market ahead of the production season. Past studies (e.g., Stifel and Minten, 2017; Kuma, 2012) have shown that market access improves market participation by increasing agricultural productivity.

Lagged market price of maize exhibited positive and significant association with farmers' decision to participate in the market, indicating that higher lagged market prices increase the likelihood of market participation. This implies that, assuming all other variables remain the same, farmers' market participation decisions will be improved by 0.8 percent if farmers perceive prices from previous season as high. Accordingly, a study by Haile *et al.* (2022) noted that the decisions of producers of maize to engage in market were connected positively and significantly by previous prices of maize. The fact that the market price of maize in this study was positive shows that maize price acts as a motivation to engage in the market.

Membership of farmer group showed a positive and highly significant relationship with farmers' market participation decision, suggesting that being part of a farmer group greatly increases the likelihood of market participation. By being a member of a farmer group, individual farmers can pool their resources and produce, allowing them to negotiate better prices and terms with buyers. This collective bargaining power can make market participation more attractive to farmers. Besides, market participation often involves various transaction costs such as transportation, storage and market fees. Farmer groups can help reduce these costs through shared resources and logistics, making it more viable for individual farmers to engage in the markets.

Table 6.7 (column 3 & 4) also displays the predicted results for the Cragg Double Hurdle model on the proportion of maize output sent to the market. The likelihood ratio test statistic demonstrates that the DHM was preferred. The estimates of the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) also showed that the Cragg's DHM suited the data better. Hence, discussions are centered on the outcomes of the Cragg's DHM. However, was also estimated as a robustness check and results of can be found in the appendix.

The second hurdle (Hurdle 2) calculated the primary determinants of the degree of engaging in the market, as shown in column 3 of Table 6.7. The variable household size showed a negative and significant coefficient, indicating that larger household sizes reduce the extent of market participation. Larger households may require more resources for sustenance, leaving less surplus for market transactions. Recent literature supports this, suggesting that larger households often prioritize household consumption over market sales, limiting their market engagement (Beadgie and Reddy, 2020; Megerssa *et al.*, 2020). In the rural areas of northern Ghana, smallholder farmers' household food supply is primarily depended on farming. This could explains the inverse correlation between farmers' market participation and household size. The quantity required for consumption increases as household members increased.

Surprisingly, the data also showed that household degree of output market participation was positively influence by number of dependents in a household, implyings that having more dependents increases the extent of market participation. This may reflect the need for additional income to support more dependents, prompting farmers to engage more in market activities. Studies show that households with more dependents often have higher financial needs, encouraging greater market participation (Balirwa and Waholi, 2019).

Also, the variable CF participation was negative and highly significant at the 1 percent statistical

level. The negative coefficient suggests that CF decreases the extent of market participation. CF typically involves agreements between farmers and buyers, where the buyers provide inputs and agree to buy the output at predetermined prices from the farmers. This arrangement can limit farmers' engagement with other market players, as they are bound to sell their produce to the contracting entity. This aligns with findings that CF can create dependency on specific buyers, potentially restricting farmers' market options (Li and Wang, 2024; Dubbert *et al.*, 2023). Also, CF often appeals to farmers because it offers price stability and reduces market risks, such as price fluctuations. Therefore, if farmers perceived high price uncertainty, they are more likely to participate in CF to mitigate these risks. However, this security comes at a cost of reduce market participation as farmers are less incentivized to engage in potentially more profitable but riskier markets (Neme *et al.*, 2024).

At the 1 percent significant level, the amount of maize produced (log) had a direct and significant effect on the likelihood of extent of market participation. The positive and significant association between the variables indicates that the likelihood of participating in the maize market increases in direct proportion to the amount of maize production generated. The marginal impact confirms that a one percentage increase in the amount of maize produced leads to a 0.1 percent rise in the amount a farmer sells in the market. This may imply that increasing farmers' production capacity could be critical to improving farmer participation in the market. The finding correlates with research by Haile et al. (2022), who concluded that increasing Ethiopia's maize output motivates farmers to increase sales. Other studies such as Kusse *et al.* (2022) and Kyaw *et al.* (2018) noted that when crop produce is more, it inspires farmers to sell higher amounts.

Additionally, the amount of maize supplied to the market for sale was strongly influenced by market distance, with a positive correlation observed at the 1 percent significance level. Generally,

this result was not anticipated since the farther farmers were from the market, the more expensive and challenging it would be to manage the transaction costs and get maize to the market. Fundamentally, a one-kilometer increase in the distance to the market is projected to result in a 1.6 percentage rise in the quantity of maize sold in the market. Research by Dlamini and Huang (2019) and Balirwa *et al.* (2016) also shown that market distance had a positive impact on market participation levels. Given that both rural and remote locations include arable land, a farmer's land availability for growing maize increases with distance from metropolitan centres. This makes it possible to produce a surplus that is more marketable and so require higher levels of market involvement. Another possible reason of this paradoxical finding is that traders might fancy distant and isolated farmers who often are out of reach for many buyers. Under such circumstances, remoteness supports intensification of sales when buyers are available. Studies by Singbo *et al.* (2021), Rashid *et al.* (2020), and Yaméogo *et al.* (2018) have shown that the degree of market involvement was significantly and negatively impacted by the distance to the closest output market.

Lastly, it was found that the amount of maize sent to the market was positively correlated with market access (denoted as 1 = market in the community and 0 = no market in the community). Accordingly, the computed marginal effect illustrates that farmers who got access to market increase the quantity of maize sent to the market by 6.2 percent as compare to those without access to market. This finding does not align with those reported by Martey *et al.* (2017), that access to market decreased the chances of increasing the amount of maize sold by 7.8 percentage points. One important factor that could have a bearing on market participation is the varying cost of entry into the market. For instance, having market in community lowers transaction costs connected with sending produce to market, which facilitates commodity sales. This variable, according to Nkegbe

et al. (2022), thus proves that in agricultural marketing, lowering costs of transaction increases the possibility of selling more.

6.4 Summary of chapter

This chapter examined the variables that affect smallholder farmers' involvement in maize output markets in northern Ghana as well as the degree to which they do so. The findings demonstrated that, in the study regions, maize is still primarily a crop grown for subsistence. A market participation index of 0.229 indicates that, of the total amount of maize produced by local farmers, 23 percent was sold and fell below the subsistence level (HCI <25%). Descriptive statistics showed that CF farmers were more commercialised with the crop; of the total maize produced by these farmers, 25 percent were sold, whereas 20.2 percent of total maize produced by non-CF farmers were sold. However, compared to 55.1 percent of purchased inputs used by CF farmers, the amount of purchased inputs utilised by non-CF farmers was low (28.7%), with the remaining inputs being either low-productive local inputs or stored inputs from the previous year.

The factors influencing smallholder farmers' decisions to engage in the market and the percentage of maize supplied to the market were explained using the Cragg's DHM. The first-stage probit model estimates show that age, level of education, household size, number of dependents, total arable land, government project in community, maize farm size, nature of road, market distance, access to market and lagged maize price significantly affect farmers' decision to participate in maize market. The second-stage estimates indicated that household size, number of dependents, CF participation, maize quantity produced, market distance and market access as significant variables which affect the proportion of maize supply to market. After controlling for endogeneity, CF participation impact farmer's decision to participate in the market positively but impacted negatively on degree of market participation.

CHAPTER SEVEN

FARMERS' INTEGRATION INTO INPUT AND OUTPUT MARKETS IN NORTHERN GHANA

7.0 Introduction

Output market participation was prominent in conceptualising smallholder maize farmers' market involvement; thus, input and output market access are critical to smallholder market participation. However, because agricultural input and output markets imposes cost, contract and non-contract households may participate in these markets differently. Thus, this chapter investigates smallholder farmers' integration into both inputs and out markets in the study area.

7.1 Integration into input market

This section delves into smallholder maize farmers' integration into maize input market in the study area. The section is divided into two main sub-sections namely access to agricultural input markets and access to agricultural output market

7.1.1 Access to agriculture inputs markets

Access to the agricultural input market has a significant impact on farmers' access to agricultural inputs and, as a result, determines farm household output. Farmers in this study will have access to input markets if they have information about the market, transportation system, and input prices to make informed decisions. Figure 7.1 depicts access to agricultural input markets by contract and non-contract maize farmers. According to the data, non-contract farmers have less access to the input market than contract farmers. Out of the 251 non-contract farmers, 164 (65.86%) had access to input markets, whereas 85 (34.14%) did not have access to input markets for maize production in the 2019 production season. Similarly, among 169 contract farmers, 150 (88.76%)

had access to input markets in the 2019 production season, with only 19 (11.24%) indicating no access to agricultural input markets. In relation to the proportions of the sample farmers in the study, the results show that more contract maize farmers have access to inputs markets than non-contract farmers, and access to market can increase households' willingness to participate in the agricultural inputs market. The value of the Pearson chi square (28.2319, p = 0.0000) shows a strong link between access to agricultural input markets and contract farming in the study area. The fact that more contract farmers have more access to the input markets reveals the importance of contract farming in improving smallholder farmers' access to input market in the area. Access to market lowers transaction costs and allows farmers to transition from subsistence farming to commercial agriculture through input commercialisation.

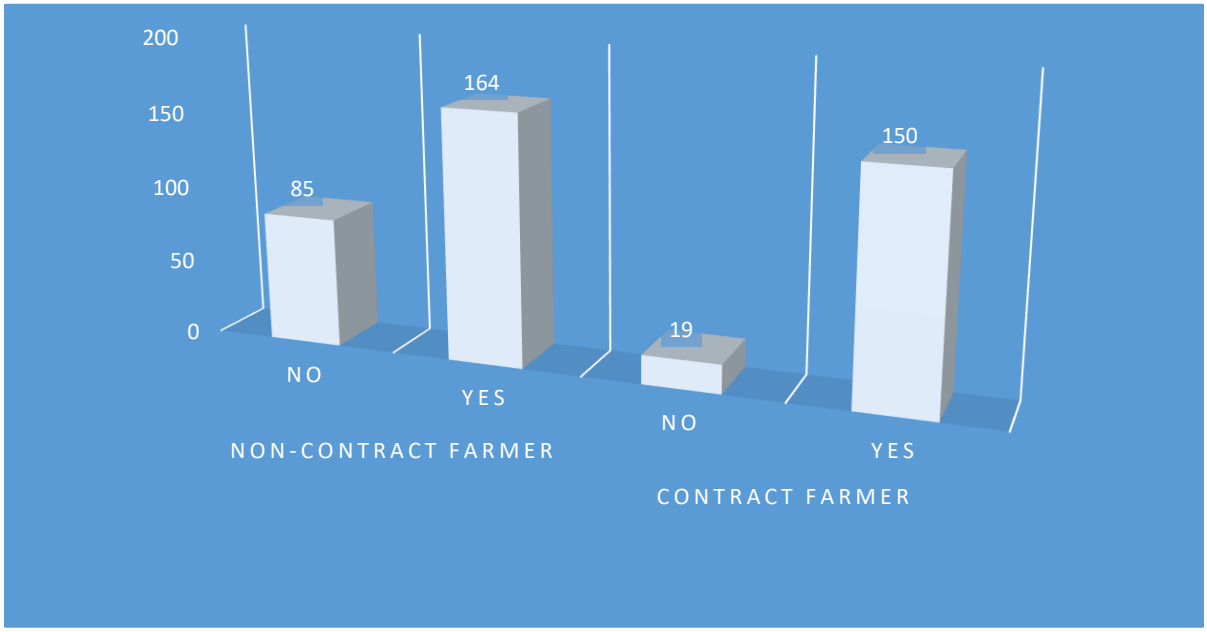

Figure 7.1: Access to Agricultural input market by farmers, *Chi2 = 28.2319, p =0.000*
Source: *Field work, (2020).*

7.1.2 Sources of input markets for farm households

Maize farm households were asked to identify their input market sources and other agricultural tools for their farm operations. Overall, four input market sources were discovered as farmers'

communities, adjacent communities, district capitals, and regional capitals. Table 7.1 shows the sources of input marketplaces as well as the distribution of contract and non-contract farmers who use them as their primary source of input. According to the data, 32.17 percent of contract and 29.94 percent of non-contract maize farmers get their inputs and farm tools in their communities. While 25.48 percent of non-contracted farmers get their inputs and farm implements from nearby communities, it is same for 23.57 percent of contract farmers. Regarding district capital as market source for inputs, approximately 8.28 percent and 2.23 percent of non-contract and contract farmers, respectively, stated that they obtain the majority of their inputs from the capitals of their respective districts. Furthermore, the regional capital was the primary source of inputs for 4.46 percent of non-contract maize farmers, whereas the regional capital was the primary source of inputs for 12.74 percent of contract maize farmers.

Table 7.1: Source of agricultural input markets

Source of input market		Contract farmer (%)	Non-contract farmer (%)	Chi2
Farmer community	Yes	101 (32.17)	94 (29.94)	3.3396*
	No	49 (15.61)	70 (22.29)	
Nearby community	Yes	74 (23.57)	80 (25.48)	0.0096
	No	76 (24.20)	84 (26.75)	
District capital	Yes	7 (2.23)	26 (8.28)	10.4249***
	No	143 (45.54)	138 (43.95)	
Regional capital	Yes	40 (12.74)	14 (4.46)	18.0841***
	No	110 (35.03)	150 (47.77)	

*Source: field work, 2020, *, *** represent 10% and 1% significance level respectively*

Surprisingly, the principal markets for contract farmers were both closer and distant than the markets for maize inputs for non-contract farmers. The explanation for this could be that maize contract farmers are located in conveniently accessible communities where people can readily

create inputs businesses and a good transportation system. This may have distinct implications for maize commercialisation in the area for contract farmers and non-contract farmers. While contract farmers may be able to commercialise due to low transaction costs, non-contract farmers may be hampered by high transaction costs while attempting to commercialise maize growing in the area. The predicted associations between the source of input markets and contract farming was significant in three of the major inputs markets namely farmer community, district capital and the regional capital. The insignificance shown by nearby community suggests no association between nearby community market and type of farmer.

7.1.3 Strategies used to acquire inputs from market for production

The procedures used by farmers to acquire inputs for production in the 2019 production season are depicted in Table 7.2. According to the results, approximately 58.91 percent of non-contracted farmers purchased their production inputs directly from the input store. Less than 1 percent also obtain their input through credit from input dealers, while 0.36 percent received inputs for production as a gift from people during the 2019 production season. Aside from the inputs obtained as a result of contract farming involvement, contracted farmers obtain inputs for maize production in the research area through other means. Approximately 20.73 percent of those who obtained additional inputs did so directly from input shops; 18.91 percent obtained the inputs on credit from input dealers, which was paid later; and 0.73 percent received inputs as a gift from others. The estimated chi-square (Chi2 = 92.9908, p = 0.0001) was significant at the statistical level of 1 percent, indicating a link between type of purchase and type of farmer.

Table 7.2: Strategies use to acquire inputs from market for production

Procurement type	Non-contract farmers		Contract farmers	
	Frequency	Percentage	Frequency	Percentage
Direct purchase	162	58.91	57	20.73
Credit	1	0.36	52	18.91
Gift	1	0.36	2	0.73

Source: field work, 2020. *Chi2 = 92.9908, p = 0.000*

7.1.4 Inputs purchase through an intermediary

Only 26 (8.28%) non-contract farmers reported they bought input for crop production through an intermediary. In addition, fifty (15.92%) of the 150 farm households that produced maize under contract stated that someone helped their input purchase in addition to the inputs obtained as part of the contract farming agreement. In Ghana, the input market has been liberalised, so a farm household does not need an intermediary to purchase inputs. A farm household can enter into any input market and buy from any input merchant without any restrictions, provided such a farmer has money. This could explain why the majority of farm households do not engage intermediaries to obtain inputs from the market. The Pearson chi-square (chi2 = 13.0479, p = 0.0001) was found to be significant at the level of 1 percent statistical level, suggesting an association between input acquisition through an intermediary and the type of farmer (See figure 7.2).

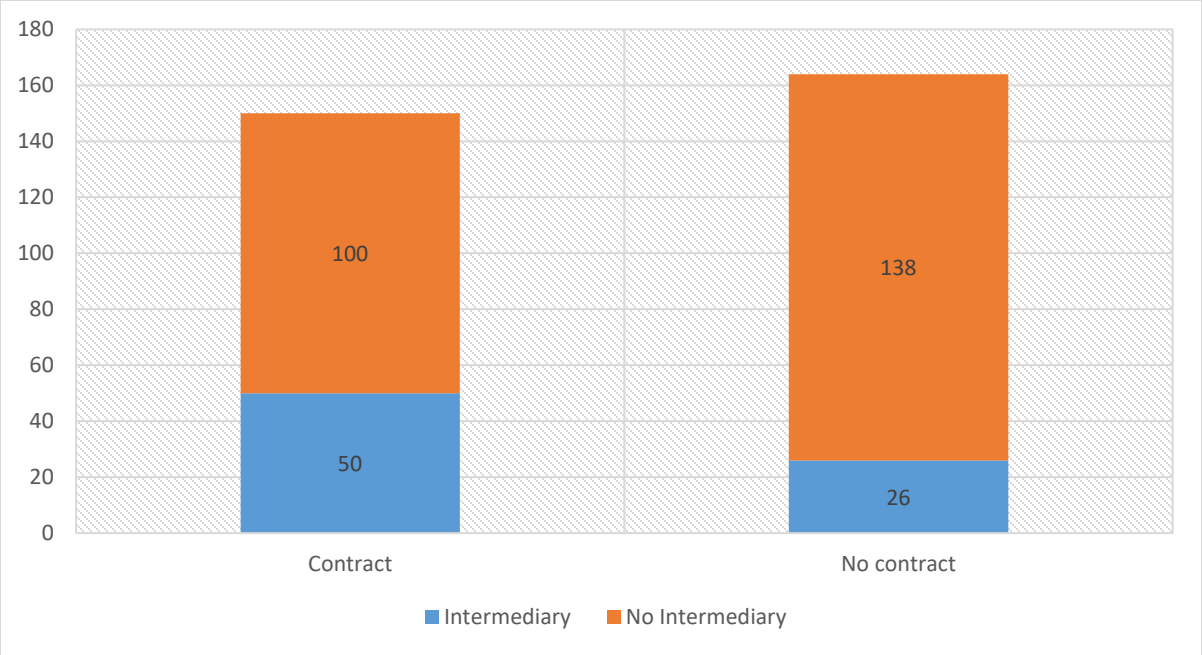

Figure 7.2: Inputs purchase through an intermediary

Source: field work, 2020. Chi2 = 13.0479, pr = 0.000

Discussions with farmers revealed that input merchants' activities are distributed over practically every major town in the research area. They stated that the only time someone may be required to mediate with an input dealer is when there are insufficient funds to purchase inputs at the moment.

> *When the season started, the money I had was not enough to pay for tractor services and again buy inputs. So I used it to pay for the tractors services and left with nothing to buy fertiliser. I have to call a friend who is a teacher and knows me very well to explain things to him and he agreed to assist. So he discussed with an input dealer in the next community and asked me to go there I pick the fertiliser (a male farmer from Wa West District).*

This narrative indicated that if a farmer does not have money and does not know the input dealer, a middleman known to the input dealer is all that is required to facilitate input purchases. Furthermore, because some of the input sellers live in the same neighbourhood of the farmers, they

can readily move to them for inputs even if they do not have the money to pay. For instance, a farmer said in support of this:

> *Because I know the input dealer, I went and explained to him that I am out of money to purchase inputs. So I told him to give the inputs to me and I will give him the money in about a month's time which he agreed and gave me the inputs. I used the inputs and paid him back as promised.*

The farmers stated that because of the national input subsidy programme, input prices are relatively cheap, and because they are small-scale farmers, their input demands are low, thus they can obtain their inputs without an intermediary.

7.1.5 Support from inputs dealers

In terms of support received from input dealers, maize contract farmers were getting more support from input dealers than non-contract farmers (Table 7.3). From the total number of farmers who produced maize under no contract only 3 (0.96%) farmers got support from input dealers for their maize farm operation. Among farmers who produced maize under contract, 24 (7.64%) of them have indicated that they received support from input dealers for their farming activities. This is a credit support service provided by the input dealers where farmers need the inputs but do not have money and because they are trustworthy, they are given the inputs which they repaid. The repayment can be in a form of physical cash later in the year or are paid in-kind with produce after harvest. Smallholder farmers' relationship with input dealers is critical as it creates a conducive environment for intensification of agriculture and enable the smallholder farmers to orient towards producing for the market, thus reducing poverty among the smallholder farmers. The chi2 value

of 20.0172 was significant at the 1 percent level, implying an association exist between input dealers and contract farming.

Table 7.3: Support from input dealers

Support of input dealers		Contract farmer (%)	Non-contract farmer (%)	Chi2
Receive support		24 (7.64)	3 (0.96)	20.0172***
No support		126 (40.13)	161 (51.27)	
Value of support		390.33	220.00	t-value = 0.2672
Pay back support	Yes	74 (23.57)	31 (9.87)	32.5956***
	No	76 (24.20)	133 (42.36)	
Payment mode	Cash	14 (13.33)	28 (26.67)	46.4124***
	Produce	60 (57.14)	3 (2.86)	

*Source: field work, 2020, *** represents 1% significance level*

Farmers who received assistance from input dealers were asked to rate the value of the assistance they received. Farmers producing maize under contract received an estimated support value of GHS 390.33, while non-contracted households received an estimated support value of GHS 220.00. However, the Pearson chi-square value (0.2672) did not exhibit a statistical significant difference, indicating that there is no significant difference between the amount of support received from input dealers by contract and non-contract farmers.

Approximately 23.57 percent of households who received assistance from input dealers and produce under contract reported repaying the assistance they received. Roughly, 9.87 percent of farmers that produce without a contract paid back the input dealers' assistance. This data implies that those producing maize under contract were more creditworthy than those producing maize under no contract. The Pearson chi-square value of 32.5956 was found to be significant at the 1

percent level which indicates there is a strong link between credit payment and contract farming. In terms of payment modality, the proportion of maize contract farmers that claimed they paid back the support in cash was 13.33 percent, while 57.14 percent paid in product. On the other hand, 26.67 percent of maize non-contract households paid back the assistance in cash, while just 2.86 percent paid back the assistance in output. The data from Table 7.3 showed that the Pearson chi-square of 46.4124 was significant at 1 percent level indicating an association exist between them.

7.2 Output market information and marketing of farm produce

This section examined maize smallholder farmers' integration into the output market in the study area.

7.2.1 Output market information

Competing in the global market today requires that farmers have access to up-to-date market information of their product, new crops, latest production methods, farming techniques seeds, water management, pesticides, agricultural and export potential (Bala and Sharma, 2008; Singh *et al.,* 2010). Marketing information helps farmers and traders plan their marketing strategy and in bargaining with other parties. Reliable market information may also help farmers to decide on where to sell, when to sell, who to sell to and to plan their production (Ferris and Robbins, 2004; Kleih *et al.,* 2006). More importantly, farmers may be aware of the types and quality of produce demanded by national, regional, and international customers (Ferris and Robbins, 2004). Farmers with access to timely and reliable market information can decide on which market they should send their produce to maximize returns.

7.2.2 Access to output market information

Access to adequate and reliable market information is crucial for households when deciding on a sale of produce and type of market. Farmers can use market information to research possible

buyers, as well as the quantity, quality, and price at which they may sell their goods. As a result, farmers' access to market information should boost their chances of selling to preferred buyer rather than middlemen at the farm gate. According to Table 7.4, 28.81 percent of contract farmers had access to market information compared to 26.67 percent of non-contract farmers who had access to market information. This finding indicated that maize households in the research area especially non-contract farmers, had restricted access to market information, which is likely to influence their bargaining power when negotiating with buyers. Due to a lack of market information, there is an information asymmetry in which the buyer takes advantage of the producers' lack of knowledge about current market conditions (Adu, 2018). The Pearson chi-square test result (chi2 = 29.7558, p = 0.000) was statistically significant at 1%, implying a high link between households' access to market information and contract farming.

Table 7.4: Access to output market information

Access to market information	Contract farmers (%)	Non-contract farmers (%)
Have access	121 (28.81)	112 (26.27)
No access	48 (11.43)	139 (33.10)
Total	169 (40.24)	251 (59.37)

Source: field work, 2020. Chi2 = 29.7558, pr = 0.000

7.2.3 Types of market information and channel of information

The study gathered data on the type of market information obtained and the channel via which it was obtained. Due to lack of market information, farmers are unable to negotiate better prices for their maize produce and are thus paid less. Farmers may be discouraged from traveling to distant

marketplaces in pursuit of better prices due to the small size of the crop and poor road conditions. Table 7.5 shows the types of market information received and the channel by which it was communicated to farmers.

According to the findings, less than half of contract farmers received price information from co-farmers. Co-farmers offered market pricing information to about 20 percent non-contract farmers. The extension agent as source of market price information was accessed by 38.86 percent of contract farmers and 2.29 percent of non-contract farmers, respectively. Farmers also get information about maize prices through the media, particularly local radio stations. In particular, 38.86 percent of contracted farmers admitted to getting this information via the media, while 29.14 percent of non-contract farmers did. Finally, traders provided this information to little more than one-third of contracted farmers, with 29.14 percent receiving it.

Market risks primarily affect the prices of food crops, especially maize that farmers expect to get after harvest. Most farmers would prefer to sell their maize crops when maize prices are high. However, because such decisions are made under uncertainty, farmers always have regrets when they sell their produce at a time when prices are lower than planned. As a result, information on when to sell maize for the highest profit was sought from the selected farm households in this study. According to Table 7.5, more than one-third of the contracted households obtained this information through their co-farmers. However, traders provided this information to a greater proportion of non-contracted families. Extension agents were used by 39.43 percent of contract households and 2.86 percent of non-contract households as a source of information on when to sell maize produce. Furthermore, 36 percent of contract households obtained this information from the media, compared to 27.43 percent of non-contract households.

Table 7.5: Type of market information and channel of information

Source	Contract farmers					Non-contract farmers				
	Price	Time to sell	Buyer	Demand	Opportunity	Price	Time to sell	Buyer	Demand	Opportunity
Extension[a]	38.86	39.43	39.43	38.86	38.29	2.86	2.86	2.29	2.29	2.29
Co-farmer[a]	42.29	40.00	39.43	37.71	39.43	22.86	20.00	21.71	19.43	20.00
Media	38.86	36.00	37.14	38.29	0.00	29.14	27.43	26.29	28.00	0.00
Traders	37.14	34.86	32.57	32.57	32.57	29.14	28.00	28.00	29.14	26.29

Source: field work, 2020. [a] *denote significant association according to chi2 test*

When farmers receive knowledge about buyers, they can choose to sell their maize to different customers either at the farm gate, the village market, to individual market women, aggregators, institutions, consumers, or to companies with whom they have an agreement. According to data collected from study farmers, approximately 40 percent of contract farmers accessed buyer information from extension agents and co-farmers. About 37.11 percent and 32.57 percent, respectively, sought buyer information from the media and traders. The main source of buyer information for non-contract farmers was traders (28%), with whom they trade their maize. In addition, 27.43 percent of non-contract farmers acquired buyer information from the media. Approximately 20 percent and 2.86 percent of co-farmers and extension agents, respectively, sort for similar information. The preceding narrative indicated that the two groups of farmers' primary sources of buyer knowledge differed.

While extension services and co-farmers were the primary sources of buyer information for contract farmers, the media was the primary source of buyer information for non-contract farmers. It's worth noting that non-contract farmers did not seek out much buyer information from co-farmers. Market demand information enables farmers to plan their production in accordance with market demand, arrange harvest times at the most profitable times, and decide which market produce should be sent to. In this study, farmers were questioned whether they received market demand information or not, and if so, from what source. Overall, extension agents and co-farmers provided market demand information to 38.86 percent and 39.43 percent of the studied farmers who produce under contract, respectively. About 38.29 percent got this knowledge from the media, while 32.57 percent got it from dealers. Extension agents and co-farmers, on the other hand, got market demand information from 2.29 percent and 19.43 percent of the sampled non-contract farmers, respectively. Furthermore, 28 percent of non-contract farmers acquired this information via the media, while 29.14 percent received information on maize demand on the market from traders.

Farmers are more motivated to try to sell their own produce, either individually or in groups, if there are markets that attract a large number of consumers or dealers looking to buy maize. One of the objectives of extension workers is to look for ways to grow or improve such farmer marketplaces. In this regard, extension agents gave information on market opportunities to 38.29 percent of contract farmers and 2.29 percent of non-contract farmers, respectively. Maize farmers also obtained this information from their co-farmer, with 39.43 percent of contract farmers receiving this information from co-farmers, while 20 percent of non-contract farmers received this information from co-farmers. Surprisingly, none of the farmers surveyed had received any market information from the media. This finding contrasts with the findings of Mokotjo and Kalusopa

(2010), who discovered that in Lesotho, the media, particularly print media, was one of the primary sources of information for farmers.

In conclusion, co-farmers can be an important source of market information, particularly about local markets. However, market information from co-farmers should not always be treated as reliable. According to FAO (2011), farmers will remember the total price they received but may not have known the exact weight that they sold (particularly when using non-standard containers), and thus cannot provide a reliable information on the price per kilogramme. Such farmers may tend to exaggerate the prices they receive. They may want other farmers to think that they are either (1) very good at negotiating with traders or (2) producers of top-quality produce which gets the best prices.

Extension agents play key roles in providing market information to farmers. An extension agent should be able to identify local buyers for various crops, and find out what prices they are paying and their terms and conditions and subsequently inform farmers. When farmers deliver produce directly to urban markets the traders in the markets are their main source of information and this information is completely up-to-date (FAO, 2011). Discussions with the farmers revealed that, farmers call the traders in advance to know the price before maize is send to the market. These farmers are those who deal with the same traders for many years and they usually rely on these traders for accurate information. However, it is important that households occasionally check with other traders and farmers in order to be sure that the traders they work with are honest.

7.2.4 Marketing of maize output

7. 2.4.1 Mode of sale of maize produce in the study area

It is not enough to produce quality maize as farmers have to find ways to sell the produced maize. The way in which farmers market is also a matter of concern for this study. With regards to how

farmers in the study area market their maize produce, the disaggregated data is presented in Figure 7.3. The figure suggests that the majority (both contract and non-contract farmers) marketed their maize produce individually. Only one and two contract and non-contract farmers respectively marketed their maize produce as a group. About 11 of the contract farmers marketed their maize individually and as a group while only 1 farmer marketed his maize individually and as a group but produce maize under no contract. The relationship between how maize is marketed in the area was significant at the 1 percent level.

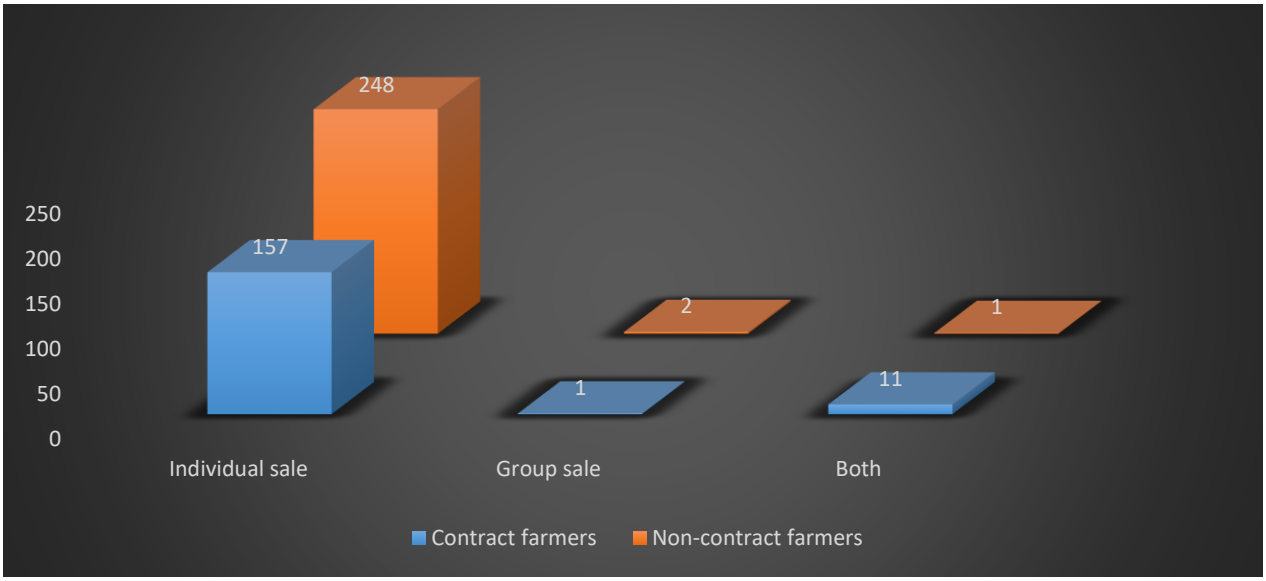

Figure 7.3: Mode of sale of maize produce in the study area

Source: field work, 2020. Chi2 = 13.6234, pr = 0.001

7. 2.4.2 Type of maize buyers

The study sought information on whether farmers sold their maize produce to regular buyers or to anyone who offered a good price. Specifically, farmers were asked if they sell to regular customers or otherwise. Table 7.6 data clearly showed that households in the research region do not sell maize to regular buyers. Only 25 percent of the contract farmers stated that they sold their maize to regular buyers. They stated that these are the buyers in whom they have faith and are confident

that they will not cheat them. Surprisingly, less than 10 percent of non-contract households sold corn to ordinary buyers.

Table 7.6: Types of maize buyers of maize

	Contract farmers	Non-contract farmers	pool sample
Regular customers	105 (25.00)	40 (9.52)	145 (34.52)
Not regular customers	64 (15.24)	211 (50.24)	275 (65.48)
Total	169 (40.24)	251 (59.76)	420 (100)

Source: field work, 2020. Chi2 = 95.3408, pr = 0.000

7.2.4.3 Major buyers of maize

The study gathered information on the primary buyers of maize sold by farmers in the study area. Table 7.7 shows the proportions of farmers in the area that sell to each client type. According to the findings, the majority of maize produce is sold to market women and aggregators. The proportion of maize farmers producing under contract and selling maize to market women was estimated to be 62.76 percent. Non-contracted farmers that sell maize to market women as their primary buyers accounted for 23.45 percent of the total sampled non-contract farmers. In the research area, the proportion of contract farmers that sold maize to aggregator buyers was around 42.76 percent, whereas the proportion of non-contract farmers was 14.48 percent. Only 8.97 percent of contract and 17.24 percent of non-contract farmers, respectively, sold directly to processors. Approximately 15.86 percent of non-contract farmers sold maize to institutions such as schools and the National Buffer Stock. Some 2.07 percent of maize farmers who produce maize under no contract also sold their maize directly to these institutions, while those who sold to other types of buyers, primarily consumers and middlemen, were estimated to none for contract farmers

and 0.69 percent for non-contract farmers. This could be due to the fact that few processors buy directly from farmers and instead go through middlemen. These findings agree with Chapoto *et al.* (2014) study, where the majority of maize and rice sales in Ghana in 2013 went to small scale merchants (39.2%), wholesalers (16.5%), and retailers (36.4 percent), with processors purchasing the smallest share of sales (0.1%).

Table 7.7: Major buyers of maize

	Contract farmers	Non-contract farmers	Chi2
Market women	91 (62.76)	34 (23.45)	0.0677
Aggregators	62 (42.76)	21 (14.48)	0.5074
Small process	25 (17.24)	13 (8.97)	1.1312
Institutions	23 (15.86)	3 (2.07)	4.0842*
Others	0 (0.00)	1 (0.69)	2.6432

*Source: field work, 2020, * represent 10% significance level*

7.2.4.4 Types of output market

Maize farmers in the study area recognised two types of markets that play a crucial role in the transactions of their maize: village markets and district or regional markets (Table 7.8). Farmers decide whether to sell in one or both marketplaces based on the market information available to them and the transaction costs associated with transferring the produce. In particular, 17.62 percent and 31.43 percent of contract and non-contract farmers, respectively, claimed that they only sell in the village markets. Similarly, the shares of contract and non-contract farmers that sold maize in either the district or regional markets were 20.95 percent and 26.19 percent, respectively. Less than 2 percent and 2.14 percent of farmers who produce under contract and those who produce

under no contract sold maize in both markets, respectively. A hamlet in the study area may have its own market or a market organised to service many communities. Magesa *et al.* (2014) discovered that market's density is affected by its geographical location. This finding suggests that non-contract farmers could have more market information than contract farmers, hence participated more in the various markets than their counterpart contract farmers. It could also be the fact that non-contract farmers sold more of the maize produce than the contract farmers as shown in chapter 6 of this study.

Table 7.8: Type of output market

Output market	Contract farmers (%)	Non-contract farmers (%)	pool
Village market	74 (17.62)	132 (31.43)	206 (49.05)
District/regional market	88 (20.95)	110 (26.19)	198 (47.14)
Both	7 (1.67)	9 (2.14)	16 (3.81)
Total	169 (40.24)	251 (59.76)	420 (100)

Source: field work, 2020. Chi2 = 3.1345, pr = 0.209

7.2.4.5 Mechanisms use to sell maize output

Contract and non-contract farmers sold their maize produce through the open market in 32.25 percent and 60 percent of cases, respectively. While no non-contract farmers sold their produce through contracts only, around 3.5 percent of contract maize growers did so after repaying the contractor's credit. Both strategies were used to sell maize by 2.75 percent and 1.5 percent of contract and non-contract farmers, respectively. Figure 7.4 depicts one such case. Non-contract farmers that reported using both market methods revealed selling under contract since these are

the persons to whom they agreed to sell their food at some time throughout the production season. They added that, while these buyers do not assist them in producing, they are people with whom they have worked with for a long time. As a result, when a farmer wants to sell their maize, they always contact them first. There is a statistical link between the market mechanism and contract farming at the 1percent level of significance (chi =20.2481, p = 0.000), suggesting a relationship between contract farming and the method used to sell maize.

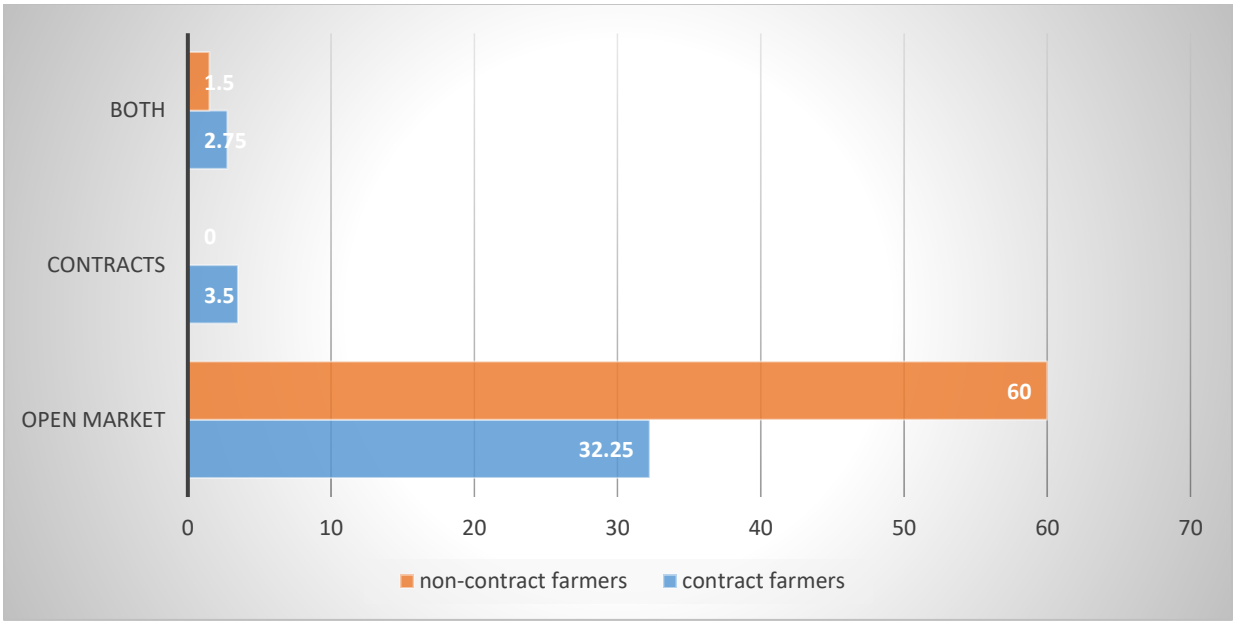

Figure 7.4: Mechanisms use to sell maize output

Source: field work, 2020. Chi2 =29.2481, pr = 0.000

7.2.4.6 Support from people maize buyers to farmers

The study also attempted to analyse the link between farm farmers and traders, specifically if farmers received any aid from the people to whom maize are being sold to. In general, the majority of households received no assistance from those who purchased their maize. According to Table 7.9, maize traders provide no support to approximately 58.57 percent and 37.14 percent of non-contract and contract farmers, respectively. Less than 2 percent and 3.10 percent of non-contract

farmers and contract farmers, respectively, received some support from maize traders in the area. This suggests that the vast majority of maize farmers have no relationship with maize buyers in the area. The Pearson chi-square test (8.0002, p = 0.005) demonstrated a relationship between maize buyer support and contract farming in the study area. This could suggest why many of the contract farmers were supported by the traders than the non-contract farmers.

Table 7.9: Support from maize buyers

Support	Contract farmers (%)	Non-contract farmers (%)	Pool
Received support	13 (3.10)	5 (1.19)	18 (4.29)
No support	156 (37.14)	246 (58.57)	402 (95.71)
Total	169 (40.24)	251 (59.76)	420 (100)

Source: field work, 2020. Chi2 = 8.0002, pr = 0.005

7.2.4.7 Engagement of middlemen

Due to a lack of market intelligence, middlemen or intermediaries who are better equipped with market information have been introduced in the value chain of most crops. For traders, it is much more efficient to buy from farmers at one or two places rather than visit each farmer individually. In fact, where the road networks are in bad state buyers cannot reach such farmers by using trucks. In situations like this, farmers require middlemen to move products to assembling points where traders gather to buy produce from the middlemen on a weekly basis. Normally, assembling points are permanent in small towns close to farming communities. In this case, such assembling points function as local wholesale markets and also as local retail markets where wholesalers, retailers and consumers converge. These middlemen perform critical marketing duties in the marketing system and the roles they play complement those of other market actors. As a result of this more

than 50 percent of non-contract farmers did indicate engagement of middlemen in the sale of their maize. On the hand, about one-quarter of contracted farmers engaged middlemen in the process of selling their maize. This data implies that engagement of middlemen is more dominant with non-contract farmers compared to contract farmers. This could be the fact that the non-contract farmers are restricted in terms of their market coverage, hence can only participate in certain markets through the middlemen. Contracting companies offer different markets to their farmers and these are unavailable to non-contract unless they go through middlemen.

Table 7.10: Engagement of middlemen

Value	Contract farmers (%)	Non-contract farmers (%)	Pool
Engaged middlemen	104 (24.76)	225 (53.57)	329 (78.33)
No middlemen	65 (15.48)	26 (6.19)	91 (21.67)
Total	169 (40.24)	251 (59.76)	420 (100)

Source: field work, 2020. Chi2 = 46.9977, pr = 0.000

7.2.4.8 Linkage with a major buyer before harvesting

In Northern Ghana, connecting smallholder farmers to markets remains a major struggle. Smallholder farmers in this area encounter difficulties in obtaining funding, improved technology and market knowledge, inadequate market infrastructure, and high transportation and transaction costs associated with selling to distant urban markets. As a result, they are forced to sell their produce shortly after harvest at cheap rates in local marketplaces near their farm. Accordingly, it is critical that these farmers are connected to major markets in the area to improve their market participation. A farmer in the area can be connected to a market by providing a good route that connects them to such markets, storage facilities where maize produce can be stored, and market

information to reduce search cost. Many of the farmers sampled for this study had no connection to the market. About 45 (10.7 %) of the studied famers who produce maize under contract reported being linked to the market. Only 9 (2.14 %) of the non-contract farmers in the sample were linked to market. This could have a significant implication if farmers are to escape the prevalent poverty in the area as majority of them do not have any link to major markets. It could affect commercialisation in the area because market participation will be low due to high transaction cost as a result of high search cost. The farmers' link to the market could be improve through rural infrastructure development, such as the construction of decent roads, storage facilities, and the establishment of temporary markets where households can easily sell their food grains.

Table 7.11: Link with major buyer

Value	Contract farmers (%)	Non-contract farmers (%)	Pool
Linked with buyer	45 (10.71)	9 (2.14)	54 (12.85)
Not linked with buyer	124 (29.52)	242 (57.62)	366 (87.14)
Total	169 (40.24)	251 (59.76)	420 (100)

Source: field work, 2020. Chi2 = 47.8585, pr = 0.000

Wiggins and Keats (2013), found that most farmers in developing nations are not connected to markets. They emphasized that this was as a result of low productivity, remoteness, low farm gate prices, and a lack of market information. Northern Ghana is characterised with inadequate infrastructure and weak connectivity from farms to markets, as well as limited access to markets and market information. Agricultural policies should not only aim at increasing food production but also emphasize agri-business. Because production cannot be deemed complete until farmers' products reach consumers, connecting farmers to markets is critical to the successful

commercialisation of smallholder agriculture. The relationship that exists between major buyer and contract farming participation was significant.

7.2.4.9 Transportation and road networks in the area

7.2.4.9.1 Transportation system

Maize after harvested must be transported from the farms to the homes either shelled or unshelled, and transporting is a difficult task that can lead to post-harvest losses. Additionally, shelled maize are carried from homes to various markets. Harvested grains can be transported from fields or farm yards to various locations using bicycles, motorbikes and trucks, and the choice of these is reliant on the availability of access roads and the farmer's cost affordability. The mode of transportation is also determined by factors such as the quantity of produce, the distance to be traveled, and the availability of motor trucks (Danilo, 2003). Farmers who do not own a means of transport have to hire transport for carting maize produce to the home or the market. As result of this, farmers means of transport were investigated and the results obtain are presented in Table 7.12.

Table 7.12: Transportation system

Transportation system		Contract farmers (%)	Non-contract farmers (%)	Chi2
Ownership of transport	Yes	29 (6.90)	82 (19.52)	*12.4047***
	No	140 (33.33)	169 (40.24)	
Available public transport	Yes	111 (26.43)	226 (53.81)	*37.7949*
	No	58 (13.81)	25 (5.95)	

*Source: field work, 2020, *** represent 1% significance level*

The results showed that significant proportions of contract farmers (33.3%) and non-contract farmers (40.2%) do not have their own means of transport. Whereas, about 7 percent of contracted

farmers have their own means of transport, 19.5 percent of non-contract households own a means of transport, suggesting that many of the contract farmers do not own their own means of transport. Owning a means of transport reduces the cost of transaction by reducing transportation cost and facilitating easy access to market. The low ownership of means transport could lower market participation by maize farmers in the area. An effective and efficient public transport system could promote smallholder market participation especially for those who do not have any means of transport except the legs.

7.2.4.9.2 Nature of road network

The condition of farm-to-market roads, as in most areas in northern part of the country remains an issue. The road network, particularly farm-to-market routes, continues to be a neglected sector in the area. Figure 7.5 presents the nature of road network in the study area especially from the farm to market. Contract farmers were located at places with access to good roads than the non-contract farmers. Particularly, 36.43 percent of farmers producing maize under contract reported that roads leading from their farms to market centres were easily motorable. For the non-contract farmers, the fraction of farmers that indicated their roads linking farms to markets were easily motorable were estimated to be 31.43 percent. For those who lamented the poor state of roads in the area, they said a greater proportion of their market surplus is lost as a result of poor transport infrastructure and a lack of storage facilities for maize in the area. Also, the poor state of the road has been reported to impact greatly on the cost of important inputs for production. These results suggest that transaction cost of contract farmers will be low and therefore increases their market participation. This also implied that contracting companies were contracting farmers who were very close to all-weathered road to reduce transaction cost. The chi square analysis revealed significant relationship exist between nature of road networks in the area and contract farming.

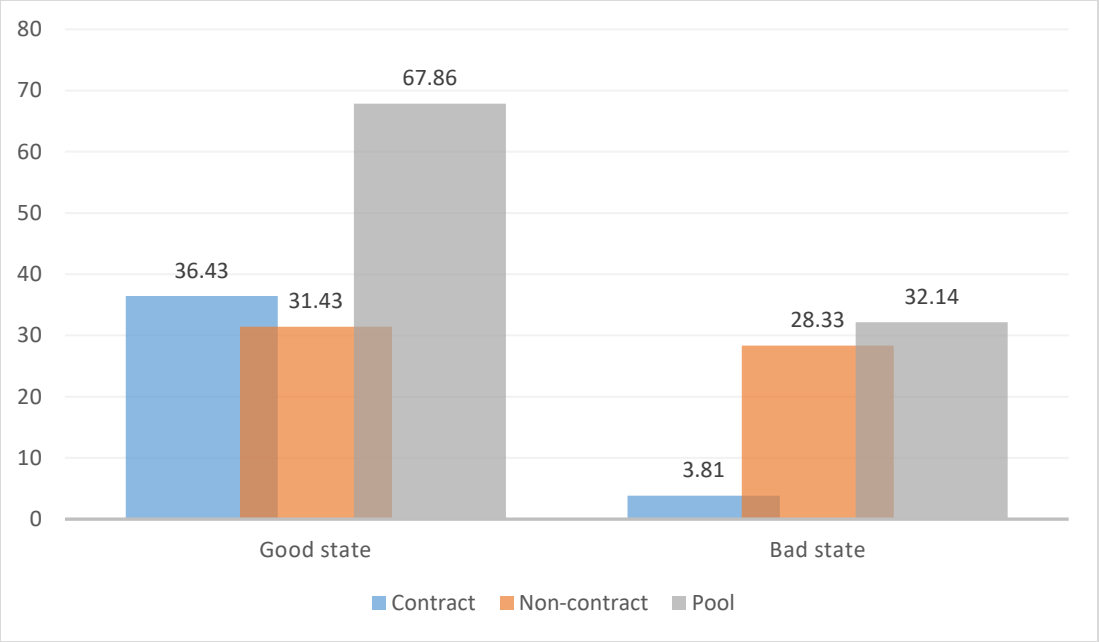

Figure 7.5: Nature of road network

Source: field work, 2020. Chi2 = 66.6641, pr = 0.000

7.3 Summary of chapter

Access to the agricultural input market has a significant impact on farmers' access to agricultural inputs. Farmers in this study would have access to the market if they had information about the market, transportation system, and input pricing to take informed decisions. According to the data, non-contract farmers have less access to the agricultural input market than contract farmers. Farmers' communities, adjacent communities, district capitals, and regional capitals are examples of these markets.

About 60 percent of non-contracted farmers purchased their production inputs directly from the input store. Less than 1 percent obtained their inputs on credit from input dealers, and 0.36% received them as a gift from others. Maize farmers in the study area recognised two types of markets that play a crucial role in the transactions of their maize: village markets and district or regional markets. Farmers decide whether to sell in one or both marketplaces based on the market

information available to them and the transaction costs associated with transferring the produce. About 17.62 percent and 31.43 percent of contract and non-contract farmers, respectively, claimed that they only sell in the village market. Contract and non-contract farmers sold their maize produce through the open market in 32.25 percent and 60 percent of cases, respectively. About 45 (10.7 %) of the studied farmers who produce maize under contract reported being linked to the market. Only 9 (2.14 %) of the non-contract farmers in the sample were linked to the market. The low proportion farmers connected to the market could have a significant implication if farmers are to escape the prevalent poverty in the area as majority of them do not have any link to major markets.

Regarding transportation in the area, the results revealed that significant proportions of contract farmers (33.3%) and non-contract farmers (40.2%) do not have their own means of transport. Owning a means of transport reduces the cost of transaction by reducing transportation cost and facilitating easy access to market. Contract farmers (36.43%) were located at places with access to good roads than the non-contract farmers (31.43%).

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.0 Introduction

This chapter presents the summary, conclusions as well as policy recommendations of the study. The first section highlights key points of the study particularly the findings. Based on the summary of findings, the study draws conclusions in section two. In the third section, recommendations and policy implications of the study's results are presented.

8.1 Summary

The role of CF in advancing smallholder maize commercialisation in sub-Saharan Africa continues to be a critical issue in the continuing debate on the effects of globalization and international trade. This study looks at how CF influence the productivity of small farms and commercialisation of agriculture in northern Ghana. Multi-stage sampling process was employed to choose 420 maize smallholders from two regions in northern Ghana. The objectives of this study were achieved using both qualitative and quantitative methods of data analysis. To achieve the study's objectives, econometrics analysis and descriptive statistics were carried out. To identify the factors that lead to CF involvement and how CF affects farm performance—which is determined by productivity and net farm income, the ESR model was used. The factors influencing farmers' decisions to enter the market and the degree of their participation—a proxy for agricultural commercialisation—were evaluated using the Cragg's DHM.

The study established that all the agribusinesses operating in the area used a similar model to operate and they all operated with the idea that by improving maize productivity and simultaneously offering farmers with a link to market, farmers participate more in the market resulting in increased income and subsequently move out of poverty. Maize contract schemes in

the area can be divided into large and small CF schemes, with large schemes run by agribusinesses and small schemes run by individual entrepreneurs, primarily traders. The agribusiness enterprises provide households with a fixed input pack that includes high-quality inputs and extension services. After the households have harvested their maize crops, they reimbursed these enterprises with a set quantity of bags of maze grain.

Objective two of this study examine the factors affecting maize smallholder farmers' decision to join CF and effect of CF on farm performance (yield and net farm income). The results revealed that farmers' decision to join CF was influenced by age of farmer, maize cultivated area, extension contact, hired labour, location, market distance, market access, mobile phone ownership, farmer group membership and nature of road network. With respect to the determinants of farm outcomes, farmer education, number of dependents, extension services, hired labour, market access and distance to major market all affect maize yield in contract farming. Number of people in a household, people living as dependents, extension services and the location variable all contributed significantly to maize yield under non-contracted maize farms. Similarly, among CF farmers, the factors that affected maize net farm income were sex of farmer, farmer's age, number of dependents, extension services, hired labour, market access and mobile phone ownership. Under the non-contracted farms, sex, size of household, maize cultivated area, farmer-based-organisation, access to market and location all have a major role in net farm income. The counterfactual analysis show that CF impacted positively and significantly on household maize farm yield. CF effect on net farm revenue was also positive, suggesting that CF participation increases net farm income for contract farmers. However, CF impact would have been positive for non-CF farmers if they had produce under CF.

The results further showed that maize in the research area is a subsistence crop (HCI <25%) with an index of 0.229. This entails that 23 percent of entire maize grown in the area by smallholder farmers was sold on average, suggesting that the commercialisation of the maize crop was in the subsistence stage. The descriptive statistics showed that the crop was more commercialised among CF farmers where 24.8 percent of the maize grown was marketed compared to 20.2 percent for non-CF farmers. The test statistic (t-test) showed that the difference was statistically significant in the degree of commercialisation between non-CF and CF farmers, implying that contract farmers were more likely to commercialise their maize production than non-CF farmers. This suggest the influence of CF schemes on the amount of maize that would be supply to the market. Similarly, the extent of purchase inputs use was low for non-CF farmers (28.7%) compare to 55.1 percent of purchase inputs used by CF farmers. Regarding the determinants of the decision to involve in the market, the study found variables including farmer's age, level of education, size of household, number of dependents and total arable land influence farmers decision. Other variables that affect market participation decision include participation in government project/programme, maize farm size, nature of road, market distance, market access and lag market price of maize. Variables like household size, number of dependents, perception on fertility of land, CF, maize farm size, quantity of maize harvested, nature of road, market distance, access to market and lag price of maize were the drivers of market participation. If CF participation is influenced by access to extension, farm size, among others then it is plausible that CF influence the degree of household commercialisation.

Furthermore, the study established that farmers' access to input market was high for contract and non-contract farmers. However, farmers producing under contract (88.8%) have higher access to inputs market as compared to 65.9 percent non-contract farmers. The test of relationship between

contract farming and access to input markets was significant (Chi2 = 28.2319, p =0.000) suggesting that contract farming influence smallholder farmers access to agricultural input market. Access to input can be described in the area as accessible as farmers indicated the availability of input shops in almost every major community in the area, therefore farmers do not need to commute long distances to access inputs. The results further showed that contract farmers were more credit worthy than non-contract farming as less than 1 percent of non-contract farm households were able to get assistance from input dealers in the area. Access to output market information is relatively low in the area as less than one-quarter each of contract and non-contract households gain access to output market information. This restricted access to output market information is likely to influence the bargaining power of households when negotiating with buyers. The majority of the farmers (contract (157) and non-contract (248)) sold their maize individually. The major maize buyers in the area are market women and aggregators even though farmers also sell to small processors, institutions and consumers in the area.

8.2 Conclusions

The study concludes that CF in maize has several benefits for smallholder farmers, particularly in terms of yield increase, access to inputs, and financial stability. However, the lack of farmer involvement in contract design is a potential area for improvement. Agribusiness firms could enhance the sustainability and equity of these arrangements by incorporating farmers' feedback and needs into the contract development process. Overall, the positive impact on yield and farmer satisfaction suggests that CF can be a viable strategy for enhancing agricultural productivity and livelihoods.

Empirically, the findings demonstrate that contract farming improves agricultural productivity and net farm income of maize farmers in northern Ghana. The estimates show a positive and

statistically significant association between maize contract farming participation and maize yields. The association between CF and net farm income was also positive. The effect of the CF in terms of yield would be greater for non-CF farmers (88%) than CF farmers (48%). In the same way, CF farmers would have low net farm income if they choose not to participate in CF, implying that CF improves farm income. The magnitude of the effect of CF would be greater on non-CF farmers if they choose to participate than CF farmers.

Smallholder maize farmers' market participation in the study area can be described as low as the mean market participation index was about 23 percent, meaning less than a quarter of the maize produce was supplied to the markets for sale. The results showed that households with large farm size and those that produce under contract participated more in the output market as compared to small farm size holders and those producing under no contract. The test statistics suggest that contracted farmers were more likely participate in the maize output market than non-contracted farmers. The regression results indicated that CF improves maize commercialisation in the study area.

Lastly, CF farmers have more access to agricultural input markets than non-CF farmers. Access to input market can be described in the area as accessible as farmers indicated the availability of input shops in almost every major community in the area. It was also found that support from input dealers to maize farmers was virtually non-existing as very few including contract and non-contract farmers receive support from input dealers to produce maize. Contracted farmers were more credit worthy than non-contract farmers as more contract farmers were able to pay back support received from input dealers. Access to information relative to the output market can be described as low in the area as less than one-quarter each of contract and non-contract households gain access to output market information. The limited access to output market information is likely

to influence the bargaining power of farmers when negotiating with buyers. Individual sale of maize produce was predominant among both CF and non-CF farmers in the study area. This suggest that in the study area farmers sell their maize output individually. Market women and aggregators were the major buyers of maize in the area even though others like small processors, institutions and consumers are also buy maize in the area. While CF farmers prefer to sell their maize at the district or regional markets, non-CF farmers prefer to market their maize at the village or nearby major market. The involvement of middlemen in the sale of maize was very low, suggesting the non-existence of intermediaries in maize value chain in the area.

8.3 Policy recommendation

The study's conclusions have significant policy ramifications, particularly for northern Ghana. The findings imply that encouraging contract farming for broader adoption might provide smallholder farmers with observable gains in the form of higher crop yield and farm income returns. Largely, the results point to the need to promote CF through the provision of better support services like input supply and extension services in order to increase household income and productivity from maize. However, this study is limited to Northern Ghana based on cross-sectional data sets. Therefore, estimates could not have accurately reflected on the dynamics of maize CF participation across the nation as well as the long-term impacts of CF on smallholder farmers' incomes and maize yield per acre. Thus, employing nationally representative longitudinal panel data sets, future research should concentrate on the adoption behaviour and dynamics of contract farming and the welfare effects of this practice.

A favourable business environment is required to alleviate market limitations and expand smallholders’ access to markets. Based on field engagements with farmers, key enablers include improved infrastructure, access to financial services, strengthened producer organizations, and

enhanced digital platforms for market linkages. The supply of public goods in rural areas, such as transportation networks and storage facilities, is critical for improving commercialisation. To ensure that local markets function well, policies should focus on enhancing market access through demand-based production strategies. Encouraging market-oriented production ensures that farmers respond to real market demands, reducing surplus wastage and price volatility. In an increasingly technologically advanced and globalized environment, mobile phones and digital platforms play a crucial role in disseminating market information, facilitating transactions, and reducing transaction costs for contract farmers. There have been several initiatives aimed at improving digitalization in agriculture, yet challenges persist. Strengthening and integrating digital platforms with contract farming arrangements can improve real-time pricing data, connect farmers to buyers, and enhance financial inclusion. Future interventions should focus on increasing mobile penetration, improving farmer digital literacy, and ensuring affordability and reliability of digital tools to enhance commercialization through contract farming. In an increasingly technologically advanced and globalised environment, mobile phones are an excellent means of disseminating information (Taku-Forchu, 2019).

According to the theory of agricultural commercialisation, smallholder maize farmers who produce larger amounts of grains are more likely to participate in the market than those who produce less grains. Therefore, in order to raise sector production and productivity and so lower poverty, farmers should be encouraged to grow more maize by giving them access to improved technology for producing maize, such as better seed, improved sowing techniques, and increased availability of fertiliser.

Smallholder maize farms with more access to infrastructure integrated in the market more actively than those with less access to infrastructure. Smallholder maize farmers should be encouraged to

produce more maize by improving infrastructure (access to markets, good road network, warehouse, drying platforms, Warehouse Receipt System (WRS) and access to contract farming) to enhance production and productivity in the sector, thus reducing poverty.

The commercialisation of maize is positively impacted by the area of land used for maize cultivation. Therefore, it is important to support technologies that raise land productivity. In addition, several areas of the study regions have limited land resources. Output-output production-based education, training, and extension services should be made available in order to improve land productivity and raise the involvement of smallholder farmers in the output market.

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APPENDIX

SURVEY INSTRUMENT

Introduction

Hi, thank you for taking your time out to participate in this survey. My name is Adams, Jongare Imoru and I am a phd student from the University for Development Studies. As part of my study I am conducting a research on **Agriculture Commercialisation and Smallholder Enhancement: A Case of Maize Contract farming in Northern Ghana.** The purpose of this survey is to understand how contract farming arrangement enhances smallholder commercialisation of agriculture. This is purely for academic leading to an award of a Philosophy Degree and does not intend to gather data on respondents for the purposes of commerce, taxation, security or any other interest to the detriment of the person, business and human rights of the respondents. I will therefore like to assure of full anonymity and will not under any circumstance disclose any specific information attributed to you or your associates. Despite this assurances you have the right to decline from participation in this survey if you deem it necessary. But if you decide to participate it is my great pleasure to thank you for accepting to contribute to agricultural development policies of the country by offering yourself to be interviewed for purposes of generating data to this noble course. Once again thank you very much for participating in this survey.

Region …….

District ……..

Community …….

Household ID…….

Phone number ……..

Date of interview……..

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLDS

A1. Name of respondent …….

A2. Sex of respondent. 0 = female 1 = Male

A3. Age of respondent…….

A4. Marital status of the respondent. 0 = Single 1 = married 2 = divorce 3 = widowed

A5. Type of Household. 0 = monogamous 1 = polygamous

A6a. Educational level of respondent. 1 = no formal education 2 = primary 3 = JHS 4 = SHS 5 = tertiary 6 = technical/vocational 7 = other

A6b. Number of years spent in school……years

A6c. Level of literacy? 0 = cannot read and write 1 = can read and write

A7. Household size …….

Number of children below 18 years	
Number of adults 18 years and above	
Number of children who work on the farm	
Number of adults who work on the farm	
Number of dependents	

A8. Respondent's status in the community? 0= community member 1 = community leader

A9. Is farming your major income generating activity 1 = Yes 2 = No

A10. Do you participate in off-farm income generating activity? 0 = Yes 1 = No

A11. The land you currently use for farming, did you own it? 1 = Yes 0 = No

A12. If no, how did you acquire the land you have cultivated in the last 12 months?

1 = share cropping 2 = relatives 3 = rent 4 = friends/neighbours 5 = community chief 6 = other (specify)

A13. What is the total cultivable land (area cultivated and area not cultivated) available to you for farming …….(acres)

A14. What is the total land area cultivated in 2019 ……(acres)

A15. Have you migrated to this present settlement? 1 = Yes 0 = No

A16. What is your primary reason for cultivating maize? 1 = Food for consumption 2 = Sell to the market 3 = partial for consumption and partial for the market

A17. Do you participate in any government agricultural project? 1 = Yes 0 = No

A18. What type of seed did you used for production? 1 = recycled seed 2 = improved seed 3 = hybrid seed

A19. Is your land area under cultivation increasing or decreasing? 1 = increasing 2 = decreasing 3= remain the same

A20. Do you sometimes invest some of the money gotten from sale of farm produce back into the farm? 1 = Yes 0 = No

A21. Have you ever grow any cash crop before? 1 = Yes 0 = No

A22. Do you keep records of your farm operations? 1 = Yes 0 = No

A23. Have you ever participated in contract farming? 1 = Yes 0 = No

A24. Do you currently participate in contract farming? 1 = Yes 0 = No

A25. Why do you currently not participating in contract farming arrangement?

……

……

A26. How much of household labour travel out of the community during farming season?

A27. Do you currently keep some livestock? 1 = Yes 0 = No

A28. What can you tell me about the quality of your land? 0 = Not fertile 1 = Fertile

If no contract farming, move to section C

SECTION B: CONTRACT FARMING

B1. What encourage you to participate in contract farming arrangement? (*multiple choice)*

S/No	Motivating factor	0 = no 1= yes	Importance
a	To receive higher price for produce		
b	To increase yields		
c	Access to high quality seed		
d	Access to credit		
e	Have a guaranteed market/buyer for crop		
f	Access to knowledge/technical assistance from contractor		
g	Guaranteed minimum price		
h	Get reliable payment		
i	Transportation is organized /No need to organize transportation to market		
j	Reliable supply of inputs		
k	Unit of measure of the product is scales		
l	Timely access to tractor services		

Codes for *importance:* *1 = not important, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important*

B2. Were you require to form a group with other farmers to be able to participate in the CF arrangement? 1 = Yes 2 = No

If yes, why?

.....

B3. How were you selected to participate in this CF scheme?

……

B4. Were you schooled on the objective of the contract arrangement before participating? 1 = Yes 0 = No

B5. Who does the education? ……..

B6. Were you issue with contractual agreement document before participating? 1 = Yes 0 = No

B7. Do you spent time to understand the contractual agreement document issue you? 1 = Yes 0 = No

B8. How many acres of land did you used for CF? ……

B9. What was the nature of your contract? 1 = written contract 2 = oral contract

B10. Were you provided with inputs? 1 = Yes 0 = No

B11. What inputs were you provided with? (*multiple choice allow)*

1 = fertilizer ( ) quantity …… 2 = hybrid seed ( ) quantity …….. 3 = improved seed ( ) quantity …… 4 = herbicides ( ) quantity …… 5 = insecticides ( ) quantity …… 4 = tractor services ( ) 5 = shelling services ( ) 6 = extension services/technical assistance ( ) number of times ……. 7 = other (specify) ……

Can you tell me the value of these inputs given to you? 1 = Yes 2 = No

How much was it? .....

B12. Are the prices of these inputs fixed before the start of the season? 1 = Yes 0 = No

B13. Are the prices of output fixed before the start of the season? 1 = Yes 2 = No, it varies according to market prices 3 = No, it varies according quality of grain 4 = No, it varies according to market price and quality

B14a. Are you require to sell all your output to the contracting company? 1 = Yes 0 = No

B14b. If no **to B8a**, is there a minimum quantity you must sell to contracting company? 1= Yes 0 = No

B14c. If yes **to B8b**, what is the minimum quantity? …….kg

B14d. If no to **B8b,** would you want to, can you sell all your output to the company? 1 = Yes 0 = No

B15. Why would you want to sell all produce to the company

……

B16. Why would you not want to sell all your produce to the company

……

B17a. Were there quality requirement under the contract? 1 = Yes 0 = No

B17b. If yes, what were the quality requirement? 1 = well dried grain 2 = uniform colour 3 = White colour 4 = Yellow colour 5 = other (specify) ……..

B17. Are technical assistance or extension services provided under the contract? 1 = Yes 0 = No

B18. If yes to **B17**, what were the management practices or technologies promoted under the contract farming arrangement? (*multiple choice)*

1 = crop rotation 2 = fertilizer use 3 = row planting 4 = new variety 5 = pest management 6 = weed management 7 = minimum tillage 8 = zero tillage 9 = conservation agriculture 10 = burying of fertilizer 11 = organic farming 12 = integrated soil fertility management 13 = intercrop with legumes 14 = other (specify)……

B19. What are the terms of default if one is unable to repay under the contract agreement? 1 = pay in cash the same year 2 = pay with other crop same year 3 = pay with maize the following season 4 = exclusion from the CF arrangement 5 = resort to court 6 = others (specify)

B20. How long have you been farming under contract arrangement?.....

B21. Since you started, have you ever defaulted in paying back the loan? 1 = Yes 0 = No

If yes what was the main reason for your default?

……

B22. Do you plan to continue with CF arrangement in the years to come? 1 = Yes 0 = No

B23. Rate your satisfaction of the CF arrangement. 1 = very satisfied 2 = satisfied 3 = somewhat satisfied 4 = not satisfied

B24. Do you normally involve in the negotiation of the contract terms or arrangement? 1 = Yes 0 = No

B25. What motivate you to join CF?

……

B26. To what extent do you think CF has impact on your crop output? 1 = increased significantly 2 = increased 3 = remained constant 4 = decreased 5 = decreased significantly

B27. Have you lost part of your farm to other farmers because of contract farming? 1 = Yes 0 = No

B28. Were there production and marketing requirement you are supposed to adhere to? 1 = Yes 0 = No

If yes, mention them

B29. Production requirements

……

……

……

B30. Marketing requirements

……

……

……

B31. Were you able to meet these requirements? 1 = Yes 0 = No

B32. Were you provided with the platform to feed your inputs into the final contract agreement? 1 = Yes 0 = No

B33. If no, why? ……

B34. Were you satisfied with the contract conditions? 1 = Yes 0 = No

B35. Will you be interested to continue with the contract farming in the years to come? 1 = Yes 0 = No

B36. Explain your answer

……

37. How many bags did you get from your contracted farm? ……

38. How much did you give to the contractor as payment of the inputs?.....

SECTION C: CROPS PRODUCE

C1. Please complete the below

Crop	Area cultivated	Cropping system	Quantity harvested	Number of years farm	Productivity
Maize					
Rice					
Soya beans					
Groundnut					
Sorghum					
Millet					
Cowpea					
Yam					
Others					

Codes for productivity *1 = increase significantly 2 = increased 3 = remained the same 4 = decrease significantly 5 = decreased*. Codes for cropping system *1 = sole cropped 2 = intercropped*

SECTION D: SMALLHOLDER LINKAGE TO INPUTS AND OUT MARKET

D1. Do you have access to agricultural inputs for your crop production during your last production season? 1 = Yes 0 = No

D2. If yes, how do get the inputs for your production? 1 = bought 2 = credit 3 = gift 4 = other…….

D3. Where do you normally buy most of your inputs for production (*tick all possible*)? 1 = farmers community 2 = nearby community 3 = district capital 4 = regional capital 5 = other (specify) ……

D4. Which mechanism do you employ in buying your inputs? 1 = written contract 2 = oral contract 3 = no contract

D5. If it is contract were you able to meet the contract terms and conditions? 1 = Yes 0 = No

D6. If no, what was the main reasons for not meeting the terms and conditions? .....

.....

D7. If yes how did you meet them?

……

……

D8. Was the acquisition of you inputs for production facilitated by someone? 1 = Yes 0 = No

D8a. If yes, provide details

……

……..

D8b. If no, how did you acquire the inputs?

……

……

D9. Do inputs dealers supply you with inputs on credit and you pay them back after harvest? 1 = Yes 0 = No

D9a. If yes, what is the value of the inputs? …….(GHc)

D10. Did you pay back? 1 = Yes 0 = No

D10a. If no, why?

……

……..

D10b. If yes, how did you pay back? 1 = paid with farm produce 2 = paid with cash

D12. Do you get any other support from your inputs dealers? 1 = Yes 0 = No

D13. Did you employ tractor services to prepare your land? 1 = Yes 0 = No

D14. Do you have any relation with tractor service providers? 1 = Yes 0 = No

D15. If yes, what relation do have with them?

.....

.....

D16. How do you sell your produce after harvest? 1 = individual sales 2 = group sales 3 = both

D17. Do you sell to regular customers? 1 = Yes 0 = No

D18. If yes, who are these customers? 1 = market women 2 = aggregators 3 = small processors 4 = institutions 5 = other (specify) ……

D19. Where are these customers located? 1 = within the community 2 = outside the community

D20. How do you supply your produce to the customers? 1 = through nearest/major market 2 = through the farm gate/community level 3 = both

D21. If produce are supply to the market, what is the distance to the market? …….miles

D22. Are the people you sell to part of a commercial value chain? 1 = Yes 0 = No

D23. In selling all your produce, which mechanism do you normally employed after harvesting? 1 = open market mechanism 2 = contracts 3 = both open market and contract

D24. If you used contract mechanism, how was the contract? 1 = written 0 = oral

D25. Did you meet the contract provisions? 1 = Yes 0 = No

If yes, how?

……

……

If no, why?

……

……

D26. How important are contract to your farm business transactions? 1 = very important 2 = important 3 = not important

D27. Does the person you sell your farm produce to support you in your farming operations? 1 = Yes 0 = No

D28. If yes, how does he/she support you? 1 = provision of credit 2 = provision of training 3 = extension service provision 4 = other (specify) ……..

D29. What amount of credit did you receive from your buyers for the last farming season? .....GHc

D30. How was the credit repaid? 1 = pay in cash 2 = pay with produce

D31. How available are buyers of your produce? 1 = readily available 2 = somehow available 3 = not available (difficult getting buyers)

D33. Do you engage middlemen in the sales of your produce? 1 = Yes 0 = No

D34. Were you link with a buyer and price agreed before harvesting of produce? 1 = Yes 0 = No

D35. Do you have a means of transport 1 = Yes 0 = No

D36. Availability of public transport in the community 1 = Yes 0 = No

D32. Do you have problems regarding marketing of your produce? 1 = Yes 0 = No

If yes, what are they?

……

……

……..

SECTION E: MARKET INFORMATION AND MARKETING OF PRODUCE

Market information

E1. Do you have access to market information? 1 = Yes 0 = No

E2. What is the nearest market centre to this community? ……

E3. What is the distance to this market? …….

E4. What is the nature of the road to this market? 0 = untarred 1 = tarred

E6. Do you own a means of transport? 1 = Yes 0 = No

E7. Do you search for market information before sale of your produce? 1 = Yes 0 = No

E8. What are the sources of market information?

Source	Type of information

	Prices	time of sale	Buyer	Market demand	Market opportunities	Others(specify)
Extension agents	0.66					
Friends						
Co-farmers						
Media						
Traders						
Others						

E9. How often do you received this market information? 1 = daily 2 = weekly 3 = monthly 4 = other (specify) ……

E10. Do you consult other farmers before making your marketing decision? 1 = Yes 0 = No

Marketing of farm produce

E11. Did you sell part or all your farm produce? 1 = Yes 0= No

E12. Do you make decision to sell crop produce before start of farm operation? 1 = Yes 0 = No

E13. Do you consider previous season price before deciding to produce? 1 = Yes 0 = No

E14. What is the distance to the nearest market where your farm produce can be sold?.....km

E15. What is the nature of the road? 1 = tarred road 2 = untarred road

E16. Did you sell your produce through guaranteed price? 1 = Yes 0 = No

E17. Output sales: In the last 12 months, what were the major you sold

Crop	Sales						
	Farmgate			Market center			
	Quantity sold	Price /bag	Total revenue	Quantity sold	Price/bag	Total revenue	Distance to market
Maize							
Rice							
Soya beans							
Millet							
Groundnut							
Sorghum							
Beans							
Yam/100							

E18. Do you have a phone? 1 = Yes 0 = No

E19. If yes, do you use the mobile phone to access market information? 1 = Yes 0 = No

E20. If yes, what specific operation(s) did you use it for? 1 = input price search 2 = output price information 3 = search for buyers 4 = other (specify)

E22. Marketing cost

Activity	Frequency	Cost per unit	Total cost
Transportation cost			
Cost of loading			
Cost of offloading			
Communication cost			
Cost of empty sacks			
Market levy			
Storage cost			
Others			

SECTION F: FARM HOUSEHOLD LABOUR ENGAGEMENT ON THE FARM

F1. Family labour: Please indicate your family members' involvement in the following operations

Activity	**Men**			**Women**			**Children below 15 years**		
	No. of people	No. of days	Hours/day	No. of people	No. of days	Hours/day	No. of people	No. of days	Hour/day
Land preparation									
Planting									
Weeding/spraying									
Fertiliser application									
Harvesting									
Shelling									
Transporting									
Drying and post-harvest activities									
Total									

F2. Hired labour; Did you employed hire labour onto your farm? 1 = Yes 0 = No

F3. If yes, which of the following farm activity did you used hired labour during the last 12 months

Activity	**Men**			**Women**			**Children below 15 years**		
	No. of people	No. of days	Cost per unit	No. of people	No. of days	Cost per unit	No. of people	No. of days	Cost per unit
Land preparation									
Planting									
Weeding/spraying									

Fertiliser application									
Harvesting									
Shelling									
Transporting									
Drying and post-harvest activities									
Total									

F4. How many of these hired labour is/are permanent? ……

F5. Do you sometimes have to hire labour outside your community? 1 = Yes 0 = No

F6. Has your labour requirement increasing or decreasing? 1 = Increasing 2 = decreasing 3 = remain same

SECTION G: FARM HOUSEHOLD INPUT USE ON THE FARM

G1. Which of the following inputs did you apply on your maize farm

S/N	Description		1=Yes 0 = No	Quantity	Cost	Mode of Access
	Fertiliser	NPK				
		Urea				
		Ammonia				
		Activa				
		Manure				
	Seed	Hybrid				
		Improved				
		Recycled				
	Herbicides	Pre-emergence				
		Post-emergence				
	Tractor services					

Codes for access: 1 = contract farming 2 = own (savings, remittances, other)

G2. What type of seed did you use for production? 1 = hybrid seed (quantity……kg) 2 improved seed (quantity……kg) 3 = recycled seed (quantity……kg) 4 = both hybrid and improved seed (quantity……kg)

SECTION H: INSTITUTIONAL SUPPORT SERVICES (DO NOT INCLUDE SERVICES PROVIDED BY CONTRACT FIRM)

1H: Access to credit

Have you apply for	If no, why?	If yes, have	If no, why?	If received,	If cash, how	Have you received this	Source of credit received?

credit in the last 12 months? *1=yes 0=no*		you received it? *1=yes 0=no*		type of credit? *1=inputs 2=cash 3=both*	much received?	amount on time for your farming activities? *1=yes 0=no*	*1=friends/relatives 2=NGO 3=farmer group 4=rural bank 5=commercial bank 6=others*
1H1	1H2	1H3	1H4	1H5	1H6	1H7	1H8

2H: Access to extension services

Do you have access to extension services? 1=*yes 0=no*	If yes, number of working contact in the last 12 months	What extension services do you received? 1=*production services 2=market information 3=processing of produce 4=credit*	Who provided you the extension services 1=*MoFA 2=NGO 3=farmer group 4=contract firm 5=other*	Have you ever participated in farm demonstration? *1=yes 0=no*	How available are extension services to you? 1=*readily available 2=sometimes availale 3=never available*
2H1	2H2	2H3	2H4	2H5	2H6

3H: farmer base organisation

3H1. Are you a member of any farmer organisation? 1 = Yes 0 = No

3H2. If yes, number of years in farmer organisation……

3H3. Is your farmer organisation a maize farmer group? 1 = Yes 0 = No

3H4. Is the group form purposely for contract farming? 1 = Yes 0 = No

SECTION I: HOUSEHOLD INCOME IN THE LAST 12 MONTHS

Source of income	**Total value received from source**
Income from livestock	
Crop production	
Agricultural labour	
Non-agricultural labour	
Salary employment (government/private sector)	
Artisan and other business and trade	
Remittances	
Rent (house, land, etc)	

Other (specify)	

SECTION J: HOUSEHOLD ASSET

ASSET	Availability 1 = yes 0 = no	Number	Value of asset today (per unit)	Source of income 1 = farming 2 = others
House				
Hoe				
Cutlass				
Radio				
Television				
Knapsack sprayer				
Mobile phone				
Refrigerator				
Bicycle				
Motorcycle				
Tricycle/motorking				
Tractor				
Car				
Bullock				
Large livestock (cattle, donkey)				
Small livestock (sheep, goats, pigs)				
Fouls				

SECTION K: HOUSEHOLD FOOD CONSUMPTION EXPENDITURE

Food item (either eaten at home/outside)	Number of day household consume item in the last 7 days	Did you purchase this item? 1 = yes 0 = no	Amount household pay in total
Cereals			
Pastries (bread, biscuits etc)			
Roots and tubers			
Legumes			
Vegetables			
Meat			
Fish			
Egg			
Dairy products			
Beverages			

Fruits			
Oils and fats			
Others			

SECTION L: HOUSEHOLD NON-FOOD EXPENDITURE

Item	Expenditure
Education	
Health	
Housing	
Clothing/footwear	
Electricity/lighting	
Mobile phone	
Gift	
Donations	
Fuel	
Travels	
Durable goods (radio, bed, mattress, mobile, tv, etc)	
Farm tools and equipment	
Others