EFFECTS OF CONTRACT FARMING ON PRODUCTION AND INCOME OF SUNFLOWER FARMERS IN KONGWA DISTRICT IN CENTRAL AGRICULTURAL ZONE OF TANZANIA

EFFECTS OF CONTRACT FARMING ON PRODUCTION AND INCOME OF SUNFLOWER FARMERS IN KONGWA DISTRICT IN CENTRAL AGRICULTURAL ZONE OF TANZANIA

By

Daniel Fabiano Mpeta

A Thesis Submitted in Fulfillments of the Requirements for Award of the Degree of Doctor of Philosophy of Mzumbe University

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by Mzumbe University, a thesis entitled **Effects of Contract Farming on Production and Income of Sunflower Farmers in Kongwa District in Central Agricultural Zone of Tanzania,** in fulfillments of the requirements for the degree of Doctor of Philosophy of Mzumbe University

Professor Joseph Kuzilwa

Major supervisor

Internal examiner

Accepted for the Board of Directorate of Research, Publication and Postgraduate Studies

DIRECTOR

DECLARATION

AND

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I, Daniel Fabiano Mpeta, declare that this thesis is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature_____

Date _____

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LIST OF ABBREVIATIONS AND ACRONYMS

ASA	Agricultural Seed Agency
ASDP	Agricultural Sector Development Programme
ASDS	Agricultural Sector Development Strategy
CEZOSOPA	Central Zone Sunflower Oil Processing Association
CF	Contract Farming
FAO	Food and Agriculture Organisation
FFS	Farmer Field School
GDP	Gross Domestic Product.
IMF	International Monetary Fund
IRDP	Institute of Rural Development Planning
LGA	Local Government Authority
LGAs	Local Government Authorities
MMA	Match Makers Associates Limited; Development consultancy and training company based in Tanzania.
MUVIWATA	Muungano wa vikundi vidogo vidogo vya wakulima Tanzania
NGOs	Non-Government Organisations
POLICOFA	Potentials and Limitations of Contract Farming
PPP	Public-Private Partnership
PSM	Propensity Score Matching (Method)
QDS	Quality Declared Seed
RLDC	Rural Livelihood Development Company
SFA	Stochastic Frontier Analysis
SNV	The Netherlands Development Organization (Stichting Nederlandse Vrijwilligers)
TANSEED	Tanzania Seed Company Limited
TASUPA	Tanzania Sunflower Processors Association
TNBC	Tanzania National Business Council
URT	United Republic of Tanzania
WB	World Bank
WEF	World Economic Forum

ABSTRACT

This thesis undertakes to explore the effects of farming contracts on technical efficiency of production and incomes of smallholders in Kongwa District. Of great interest in the study is fact that, farming contracts examined involve sunflower crop, a low value crop which does not belong to conventional crops considered to be *ideal* crops for contract farming.

Most contract crops as described in Prowse (2012) are often those which exhibit higher net return per hectare of land than staples; have high degree of perishability and require product homogeneity in their production, high hygiene, and safety requirement at the end market. They are crops such as vegetables, fruits, flowers, ornamentals, condiments and spices whose transactions costs in spot market are usually high (Temu&Temu, 2005; Prowse, 2012). Sunflower does not have such characteristics. It is an easy to grow crop, an indispensable edible crop, with low perishability and with many buyers. Econometric modeling is used to determine the contract effects on productivity and income of sunflower farmers. Considering contract farming as a governance form between smallholders and agri-business firms, the study uses a value chain approach to examine the role of contracting firms in coordination of trade relationships.

A cross-sectional data set of 400 small-scale sunflower farmers in Kongwa District and chain survey data covering 7 sunflower processing firms based in Dodoma and Singida practicing contract farming are used. Results show that participating in contract farming lead to an average increase in technical efficiency of a farmer by 4.5 - 7.4 percent. Contract participation also increases land productivity of a famer.The expected output per acre of contract farm is 24% higher than non-contact farm. Similarly, contract farmers realize positive income effects from sunflower production. Results also show that innovativeness of firms and collaborations with Local Government Authorities, are a key to contract farming success. Promotion of contract farming could be done by e.g. providing improved services to contract firms and farmers such as by supporting the availability of improved seeds, and creating conducive contract farming laws and regulations.

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CHAPTER ONE

INTRODUCTION AND OVERVIEW

1.1 Background to the problem

1.1.1 Introduction

Over the past three decades, a number of developing countries in Africa including Tanzania have made efforts to revive their economies by implementing extensive changes in the organizational and regulatory frameworks of their agricultural sector. The sectoral changes have been implemented under auspices of the IMF and the World Bank (WB) within the broad economic policy reform programs of the two institutions for developing countries of 1980s and 1990s (Oya, 2012). The main aim has been curbing off the decline of the sector and restoring of the sectoral economic efficiency in order to make agriculture a propellant of the overall economy. This would subsequently improve income and the quality of life of the majority smallholder farmers particularly those in rural parts (Oya, 2012).

The Government of the United Republic Tanzania (URT) assigns a particular importance to agricultural development because; agriculture and particularly farm activities still constitute the major component of the Tanzanian economy. It provides livelihood to more than 70% of all the population. It accounts for about 24% of the GDP, 30% of total exports and about 65% of raw materials for domestic industries. It provides significant linkages, both backward and forward linkages with other non-farm sectors. Furthermore, it accounts for the national inflation since; about 50% of the inflation basket is related to food availability (URT, 2012). Agriculture thus, constitutes the back born of the Tanzanian economy, and agricultural sector advancement remains a key task the nation government has to achieve.

After 1980, Tanzania changed its agricultural policies orientation from the former socialist orientated policies towards the open-market agricultural policies with limited state interventions and extended role of the private sector (IMF, 1999). The

objective has been to create a dynamic and modern competitive agriculture sector in which the marketing of both agricultural inputs and outputs is liberalised. The Government has ever since worked to encourage development of strong private sector and public-private partnerships in the agricultural sector development programmes, in which institutional arrangements like contract farming(CF) schemes are encouraged.

In the beginning, strategies for implementing reforms were articulated in the Agricultural Sector Development Strategy (ASDS) drawn in 2001 and its subsequent Agricultural Sector Development Programme (ASDP) formulated and adopted in 2006, which ever since became the basis of the government's budgetary and general resource allocations. The major issues outlined in ASDP include strengthening of institutional framework, reforms in agricultural research and extension services, facilitation of investments, development of markets, rural infrastructure, irrigation schemes, and water management, and better fiscal rules (URT/FAO, 2008). Through a more recent programme, the *Kilimo Kwanza*[1] Initiatives (URT, 2009a) the government has underlined the importance of CF in agricultural sector advancement efforts. It emphasizes the need of establishing appropriate institutional arrangements including drafting appropriate laws to guide and protect CF system in the country as stipulated in pillar seven (URT, 2009a).

Despite the many policy efforts made, agriculture sector in Tanzania remains one of the undeveloped sectors, depicting almost the unchanging pattern of production. Smallholder producers dominate the sector, while large estates of out growers remain few. For the past 10 years, the agricultural sector's annual growth rate remained

[1] Kilimo kwanza is the supplementary initiative to ASDP jointly conceived by the private sector and the government to revamp agricultural transformation strategies to attain the goal of reducing poverty.

stunted at 4.3 percent (URT, 2012a). Market imperfections or failures still prevail in the areas of credit, insurance, information, inputs, and product markets (TNBC, 2009). Tanzania still has low volumes of commodity production, for example; there persists unmet demand for raw sunflower seeds. Competition for raw sunflower is so high such that market transactions last for between four and six months only in a year. It is in record that many micro, small and medium scale oil processing firms close their business due to lack of raw materials in the period of four to six months after harvest season (URT/FAO,2008). Sunflower processors complain about unreliable supply, very low volumes, and poor quality of seeds.

Liberalization of agricultural marketing has brought in several private agribusiness firms buying sunflower for trade and processing, creating open and expanded market for sunflower farmers. On the other hand, liberalization process has exposed smallholder farmers to free force of open market competitions in many cases without adequate preparations. Farmers have to operate in new market conditions in which they have to confront new challenges of production and marketing such as meeting the specified market obligations, by volume, value, quality, and hygiene standards. Markets are basically still poorly serviced. Smallholders in rural areas are not able to obtain adequate amount of the basic farm inputs they need for production and cannot access profitable product markets within and outside the country. They are financially constrained and can't access credit assistance nor credit guarantee and information on markets, and consequently they can't easily meet the modern production and marketing standards requirements. They subsequently fail to benefit from growing openness in product markets (URT/FAO, 2008; TNBC, 2009). Lack of adequate coordination between the government and the private sector has limited many smallholders from taking advantage of the business opportunities unfolding in the new liberalised economic environment.

In dealing with these emerging production and marketing challenges, smallholder sunflower producers have pursued different strategies such as going into various forms of CF arrangements. Certain firms (processors) have resorted to pursuing contract farming system in order to influence and control production of commercial

volumes of satisfactory quality sunflower produce they need. The government on its side has increasingly promoted CF system by encouraging public-private partnerships in its national development programmes as outlined in the ASDP and *Kilimo kwanza* initiatives. It is considered that with CF there is possibility of farmers benefiting from access to product market, inexpensive credit, farm inputs, extension services, and a risk sharing arrangement (RLDC, 2008). Successful CF system may lead to, among others, productivity improvement, minimization of production costs, increased income of farmers, and the overall improved local and national economic conditions.

1.1.2 The contract farming debate

The literature suggests that in the context of neo-liberalization policies in which the local farmers in developing countries like Tanzania are left to the full forces of global market competition, CF system emerges as the powerful institutional innovation that can help smallholders regain and take advantages of market opportunities resulting from liberalisation (Errapa, 2006; Patrick, 2004). According to World Bank (2001), CF emerges as a new avenue where private firms in developing countries can take over, roles previously served by the government in provision of inputs, credits, information, and product market for smallholder farmers.CF is potentially a way of overcoming market imperfections.

Through CF agro-business firms can help smallholders shift from subsistence farming to commercial production in which high-value products are produced in large quantity, and high income earned. And through multiplier effects, livelihoods of many other people outside the sector can be improved (Eaton & Shepherd 2001; Patrick, 2004). CF is considered to be an appropriate mechanism for integrating smallholders including those in rural areas into dynamic markets (Ruben &Saenz, 2008) in which transaction costs and risks are minimised (WB, 2007).CF therefore, can serve as a tool to enhance the integrated rural development (Reardon & Timmer, 2007). Smallholders gain access to support services from downstream chain actors like processors, and are assisted to upgrade their production capability, with which

they manage to produce high yield and good quality produce (McCormick & Schmitz, 2001).

On the other hand, CF like any other form of commercial agreement has a potential of being a disadvantage and risk to smallholder farmers particularly the poorest farmers. Critics see CF as a strategy for agribusiness firms (traders and processors) to pass production risks to farmers, taking advantage of unequal bargaining relationships. Several studies have indicated that CF can harm directly or indirectly the small farmers involved (Glover & Kusterer, 1990; Sachiko, Nicholas, & Dinghuan, 2007; Ghosh & Thorat, 2003; Little & Watts, 1994). The common problems associated with CF include; the widespread manipulation of contracts by large companies, poor enforceability of agreed terms of contracts, i.e. failure to deliver as expected or changing of pre-agreed standards, down grading of crop on delivery, and overpricing of inputs (Carney & Watts, 1990). It is further argued(Porter &Howard, 1997) that, without strong institutional set up, in a small open economy (like Tanzania), CF may worsen rural income structure by favouring large scale farmers and agribusiness firms at the expense of many small-scale farmers. CF is exploitative when it involves a highly unequal power relationship so that contract farmers are relegated to the status of hired hands, (Little, 1994).

CF system, a private sector-led business set up, which has been successfully implemented in other developing countries, may also provide benefits for smallholders in the sunflower sub sector in Tanzania. CF has existed in Tanzania for decades but, it has largely confined itself to few non-food traditional cash crops. As Tanzania was implementing its second phase of the National Strategy for Growth and Reduction of Poverty (2010-2014), it recognized private sector development as the vehicle for economic growth and poverty reduction. CF is underlined as the appropriate strategy of involving private sector in facilitating and sustaining smallholder farming not only in few traditional cash crops but also in many other crops including ordinary crops which may be produced commercially to enhance economic growth and reduction of poverty at household level (TNBC, 2009; URT, 2009).

While the popular notion is that, CF has power to overcome market imperfections, its actual effects on variables of interests on the ground remains mixed. In regard to Tanzania, some success stories are reported. The number of small farmers growing sunflower on contact basis in the central agricultural zone of Tanzania consisting of Dodoma, Singida and Manyara administrative regions has been increasing, and has recently been estimated at about 250,000 in 2009 (RLDC, 2009).Contract farmers are increasingly using quality seeds, applying modern agronomic practices, and yield per acre has increased from an average of 3.5 bags before contract programme to 8 bags after adoption of the contract farming practices (RLDC, 2009). A standard bag of sunflower harvest has 70 Kilogrammes.

In other places, however, problems in contractual arrangements are reported, including many farmers breaching contracts and selling outside the contracts. Yields in some seasons have been below expectations and incomes are low for some farmers, and in spite of high competition in the sunflower produce market and the CF arrangements prevailing, producers are still complaining of low and unpredictable prices for their produce (MMA, 2008).

In Tanzania there is currently a lack of knowledge relating to types of contractual arrangements practiced in the sunflower sub sector of Tanzania. Costs and risks embedded in the existing contracts are not known and the effects of contracts on technical efficiency, productivity, and income of smallholder sunflower farmers are not clearly known. Information is also needed to understand the value chain dynamics to establish how value addition is enhanced for farmers and small and medium-scale processors operating in the sub-sector in the present market environment.

1.2 Objective of the study

The general objective of this study is to examine the effects of CF system on production and income of smallholder sunflower farmers in Tanzania taking into account, the crop value chain dynamics. Specifically this study sets out,

i. To investigate how contracts are determined, enforced and contractual problems addressed

ii. To measure the effects of CF on farmers' technical efficiency and productivity.

iii. To measure the effect of CF on farmers' income.

iv. To assess the effectiveness of local processing firms in enhancing coordination of the sunflower value chain through CF trade relationships.

Thus, the specific research questions addressed in this study are,

i. How are contracts determined, enforced and the contractual problems such as moral hazards addressed?

ii. What is the effect of CF on technical efficiency and productivity of small-scale sunflower producers in Kongwa district

iii. What is the effect of CF on income of smallholder sunflower producers in Kongwa?

iv. How effective are local sunflower oil processing firms in enhancing coordination of sunflower value chain development?

1.3 Conceptual Framework of study

To obtain a comprehensive theoretical support for the different aspects of the intended empirical investigation, the analytical framework for the analysis of this study is developed on the basis of the two theoretical models which enter into discussions and empirical investigations. These are; the Principal Agent Model (Laffont & Martimort, 2002) and more especially its augmented form, the holistic approach to contract theory model (Bogetoft & Olesen, 2004)and the Global Value Chain frame work (Gereffi, Humphrey, & Sturgeon, 2005).

The holistic approach to contract theory provides an integrated framework for the analysis of the contractual relationship between firms and farmers based on the concepts of coordination, motivation, and transaction cost minimisation. This follows from the fact that CF is generally a form of vertical coordination between agricultural

producers and buyers undertaken in situation of information asymmetry Thus, emphasis is on how to achieve necessary incentives given the uncertainty surrounding whether a farmer will actually deliver and the related transaction costs.

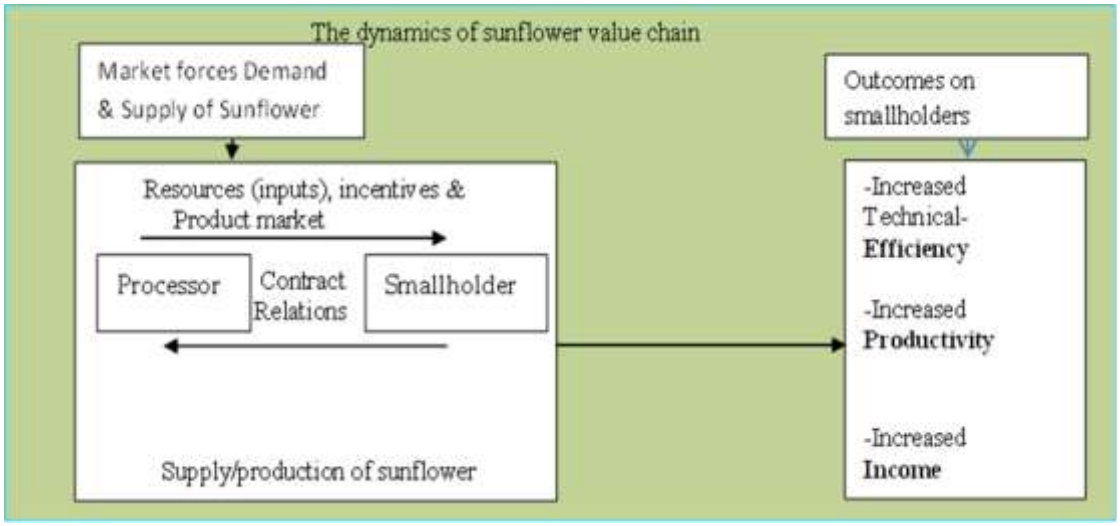
Global Value Chains (GVC) theory on its part provides a frame work for relational forms and processes between firms and farmers in marketing networks, whereby lead firms have important role of coordination. According to Gereffi et al. (2005) there are five possible types of links that may arise between firms and farmers. The market based relation, modular, relational, captive and hierarchical relations. One of the predicted outcomes in chain theories of global production and marketing is the possibility of relating global processes to firm level strategies, lead firms taking a role in organisation and coordination of the chain (Gereffi et al., 2005).

This conceptual marriage of chain theory and contract theory is more suited for analysis of effects of contracts on production and income of smallholder sunflower farmers as it incorporates the logics of value chain in understanding farming contracts. It tries to develop a map for links between downstream drivers and smallholder farmers at the beginning of the chain. It explains the chain drivers and the significance of their actions for outcomes such as efficiency and income among farmers while at the same time it provides a basis for understanding how farming contracts (linkages) are proposed, negotiated and accepted by smallholders in a value chain context.

According to the conceptual framework employed in this study, a firm proposes the area and chooses farmers with whom it would like to contract and sets the contract terms. The farmers, in turn are free to choose whether or not to participate in the scheme. Thus, firms and farmers go into agreements based on expected mutual benefits. However, the benefits received depend on who agrees to participate and how he/she participates in the scheme. The benefits gained from participating into the CF scheme depend on the terms of the contract and the characteristics of the participants. In addition, there are many other factors, (the dynamics of the crop value chain) influencing the actual operations and hence profitability of contractual

arrangements. These include; the institutional framework and the role of several independent development agents such as NGOs, credit institutions and infrastructural set-up in particular place

Figure 1.1: The conceptual framework built on principal-agent model and the value chain framework



Source: Adopted and modified from (Laffont & Martimort, 2002; Bogetoft & Olesen, 2004; Gereffi, Humphrey, & Sturgeon, 2005)

Key Concepts:

Sunflower value chain dynamics; this refers to several forces which are influencing crop value chain development. They consist of the regulations, policies, trade regimes, market interventions, interactions and infrastructure at the local, national and international levels. They also include the role of promoting agents; the government agencies, aid agencies, private agencies, NGOs and international organizations which carry out support activities and interventions to foster for example, adoption of technology, new form of production and marketing organization like contractual relationships to achieve significant and sustainable development of farmers and the overall crop sub-sector.

Contractual relationship; this is an institutional arrangements, involving vertical coordination in which the aim is to maximize the integrated profit.[2], the trader (the principal) works with a farmer (the agent) to produce a crop in conditions of asymmetric information. Thus, emphasis is put on incentives, given the information asymmetries (the uncertainty surrounding whether a farmer will actually deliver) and the related transaction costs.

Markets; it is understood that there exists production deficit in terms of quality and quantity of the agricultural produce, and consumers' demand is increasingly being tied to product quality. There is market demand for improved product and buyers can absorb additional quantities produced and are willing to pay higher for better qualities. This provides a fertile background for development of vertically coordinated production chain (Gereffi et al., 2005).

*Outcomes on smallholder farmers***;** with improved access to credit, inputs, information services and product market through contracts, farmers can achieve high levels of technical efficiency, therefore higher productivity, and higher and stable income.

1.4 Scope of the study

Contemporary adoption of the free market policies in developing countries has seen states withdrawing from direct regulation of agricultural production and marketing. That has in turn, paved a way for increased importance and role of the private sector in driving development and prosperity of farmers and their countries following the increased freedom of enterprises (Norberg, 2009).

This study assumes that in the absence of government interventions in production and marketing processes, there emerge new forms of institutional marketing organisation managed by private sector or public-private sector partnerships based on

[2]The sum of the profits of all the contracting parties, the producer and the buyer(Bogetoft & Olesen,2004)

property ownership laws, that protect enterprise and competition which bring about needed market linkages.

CF is an innovative business arrangement. It is one form of institutional market organisation under market economic environment that can support development of new profitable market linkages for smallholder farmers. This thesis therefore focuses on the effects of CF on variables of interest in this study; the technical efficiency, productivity and income of smallholder sunflower farmers. It does not consider whether CF is necessary or not, neither does it consider contract farming or out growers scheme involving big national or multinational companies but rather, small scale-farming in relation to local small and medium agro-industrial enterprises which are important actors in the local market linkages and local economy development.

CF has existed in Tanzania for decades, but it has often been practiced mainly in cash crops such as tobacco, tea and sugar cane involving big commercial firms, and government corporations. It is only recently that CF has been promoted and extended to cover more crops such as Irish potatoes and sunflower which are not conventional cash crops. Other crops currently prospering under CF system include cotton and simsim.

In addition, the thesis further focuses specifically on the role of private integrators, the contracting firms, in enhancing coordination of the overall development of the sunflower crop value chain.

1.5 Contribution of the study

This study makes two major contributions. Most studies on CF have focused on farming contracts involving ideal contract crops, the high value crops. High value crops generally refer to non-staple agricultural crops such as vegetables, fruits, flowers, ornamentals, condiments and spices. High value agricultural crops are known to have a higher net return per hectare of land than staples or other widely grown crops. And usually have high degree of perishability; require product homogeneity in their production, high hygiene and safety requirement at the end

market, low familiarity by farmers on the production methods and market requirements (Temu & Temu, 2006).

For these, products spot markets are thought to have high transaction costs (Temu & Temu, 2006; Minot, 2011). This thesis breaks this tradition and focuses on studying farming contracts involving one of the low value crops, sunflower, for which the above characteristics don't hold true.

Sunflower is an indispensable edible commodity, with low perishability, with many buyers, largely local small and medium traders or agribusiness firms. It is a very simple to grow crop that is well adapted to the dry climatic conditions of central agricultural zone and other parts of Tanzania. Sunflower may relatively have higher value than most of crops widely grown in same area like maize and millet but even such crops are similarly not ideal and conventional contract crop.

Secondly, this thesis contributes to impact evaluation literature by applying a relatively new statistical method of analysis, the propensity score matching method (PSM) which has conventionally been used in medical studies. The method, which is based on the conditional independence or confoundedness assumption, effectively address the problem of self-selection bias inherent in choice problems in observational data, and helps in production of consistent and unbiased results.

1.6 Research methodology

1.6.1 The study area

Sunflower is the common name for the plant *Helianthus Annuus*, native to Americas. It possesses a large flowering head and is named after its ability to follow the sun in the course of a day. It is an annual plant which grows well under full sun (Mayhew &Penny, 1988). Given these characteristics, the crop is adaptable over a wide range of environments in Tanzania where it was introduced during colonial period.

The crop is popular in the Central, Eastern, Northern and Southern Highlands of Tanzania. The flower head that is harvested has seeds which are dried and pressed to

obtain sunflower oil. Sunflower oil is basically used for cooking, but it is also used in production of margarine and biodisel. Moreover, the seed cake produced after extraction of oil is used animal feed.

Sunflower is one of the most important oilseed crops grown in Tanzania. It is gaining popularity and current statistics shows that local production of both factory and home extracted oils contributes to about 31% of the national cooking oil requirement (RLDC,2012a), with the remaining percentage being produced from other oil seeds namely cotton, groundnuts, palm oil and another portion imported (ARI Ilonga, 2008; Mpagalile, Ishengoma, & Gillah, 2008).

Due to limited resources, it was not possible to study all sunflower growing areas; moreover, sunflower production under contract system is not practiced in all areas. The study is therefore limited geographically to central agricultural zone of Tanzania which produces 61% of all sunflower output produced in the country (RLDC, 2012a).The region includes the administrative regions of Dodoma and Singida and Manyara.

Detailed primary survey data for analysis of study objectives number 1, 2 and 3 were collected from Kongwa District, while value chain data for analysis of objective 4 were collected from the districts of Dodoma urban and Iramba. Kongwa and Iramba are two districts where contract farming features significantly when compared to other districts. The choice of the sites was also based on the known records of contracts (RLDC, 2009). The districts have a favorable climate for sunflower production and there exist numerous small and medium sunflower oil processing plants in urban centres and townships which offer markets to sunflower farmers in the area.

Geographic location

The central zone represented by Dodoma and Singida, lies between latitude 3^0 52" and7^0 34" (degrees) South Latitude and $33^0$27" 5'and38^0 E. (degrees) East Longitude, an area of about 140,227 km^2 (URT, 2007a, 2007b).The region is

subdivided into administrative districts as follows; Dodoma has seven districts namely Dodoma urban, Bahi, Kondoa, Chemba, Kongwa, Chamwino and Mpwapwa. Singida has six districts of Manyoni, Iramba, Ikungi, Mkalama, Singida Municipal council and Singida rural. The whole region has population, according to 2012 Population and Housing Census General Report (URT, 2012), as follows, Dodoma (2,083, 588), Singida (1,370,637).

Much of the region is plateau rising gradually from some 830 meters in Bahi swamps to 2,000 meters above sea level in the highlands North of Kondoa. Generally the central region has a dry savanna type of climate, which is characterized by a long dry season lasting between late April to early December and a short single wet season during the remaining months. The average annual rainfall is at 570mm; it gets up to800mm annually in higher altitude areas of Kongwa, Mpwapwa, Kondoa, and Singida rural districts, these are most agriculturally productive areas.

Temperature in the region varies according to altitude, but generally, the average maximum and minimum for October and December are 31^{o}C and 18^{o}C (degrees Centigrade) respectively. The corresponding figures for the cool dry season of June – August are 27^{o} C to 28^{o} C (max) and 10^{o} C to 11^{o} C (min) degree centigrade, (URT, 2007a, 2007b).

The typical and main economic activities in these regions which are semi-arid are; crop production, livestock keeping and mining. Maize is the dominant staple crop grown in region. Other annual crops of relative importance in the region include; groundnuts, sorghum, cassava, finger millet, sweet potato, paddy and beans. Other annual crops grown in minor quantities are such as Irish potatoes and banana. The sunflower is the dominant cash crop, followed by other crops like cotton and onions and tobacco (in Singida).

Kongwa District

Kongwa District is one of the 7 districts of the Dodoma Region of Tanzania. Other districts are; Dodoma urban (Dodoma municipality), Bahi, Chamwino, Chemba,

Mpwapwa and Kondoa. It is located 86 Kilometers from Dodoma Regional Headquarter. It lies between Latitudes 5°30'-6° 11' 58" South and Longitude 36°15'and 36° 24' 50" East of Greenwich meridian. It is bordered to the North by Chemba District, to the East by Gairo and Kilosa Districts, to the South by the Mpwapwa District and to the West by the Chamwino District(URT,2013a).

Administrative structures

Kongwa District has 3 Divisions, namely Mlali, Zoisa and Kongwa. It has a total number of 22 wards, 74 Villages and 312 sub-villages. The district covers a total area of 4,041 Km square (URT, 2013a).

Population

According to the 2012 National Population Census (URT, 2013a), the district had a total population of 309,056. Of the total population, 149,221(48.3%) people are male while 160,752(51.3%) people female. The estimated total number of households is 61811 with the average household size of 5.0 people.

Landscape and climatic conditions

Most part of the district is predominantly arid with spontaneous mountain chains especially in the southern and western parts. Its altitude stretches between 900 and 1000 meters above sea level. The district has a dry savanna type of climate, which is characterized by a long dry season lasting between late April to late December and a short single wet season during the month of January, February, March and April. The district lies in a rain shadow behind the mountains area in the eastern side. The district has rainfall that is low and erratic in frequency and amount (particularly in the month of February) ranging on average from 600–700mm per annum with the average temperature of 27°C (URT, 2013b).

The economy

Agriculture and livestock keeping are the main economic activities undertaken by about 90% of residents in Kongwa district. Kongwa District is endowed with plain and fertile land suitable for agricultural production. Climatic conditions favour production of maize and oil seed crops like sunflower and groundnuts. The area has high water table and natural springs which suits irrigation farming.

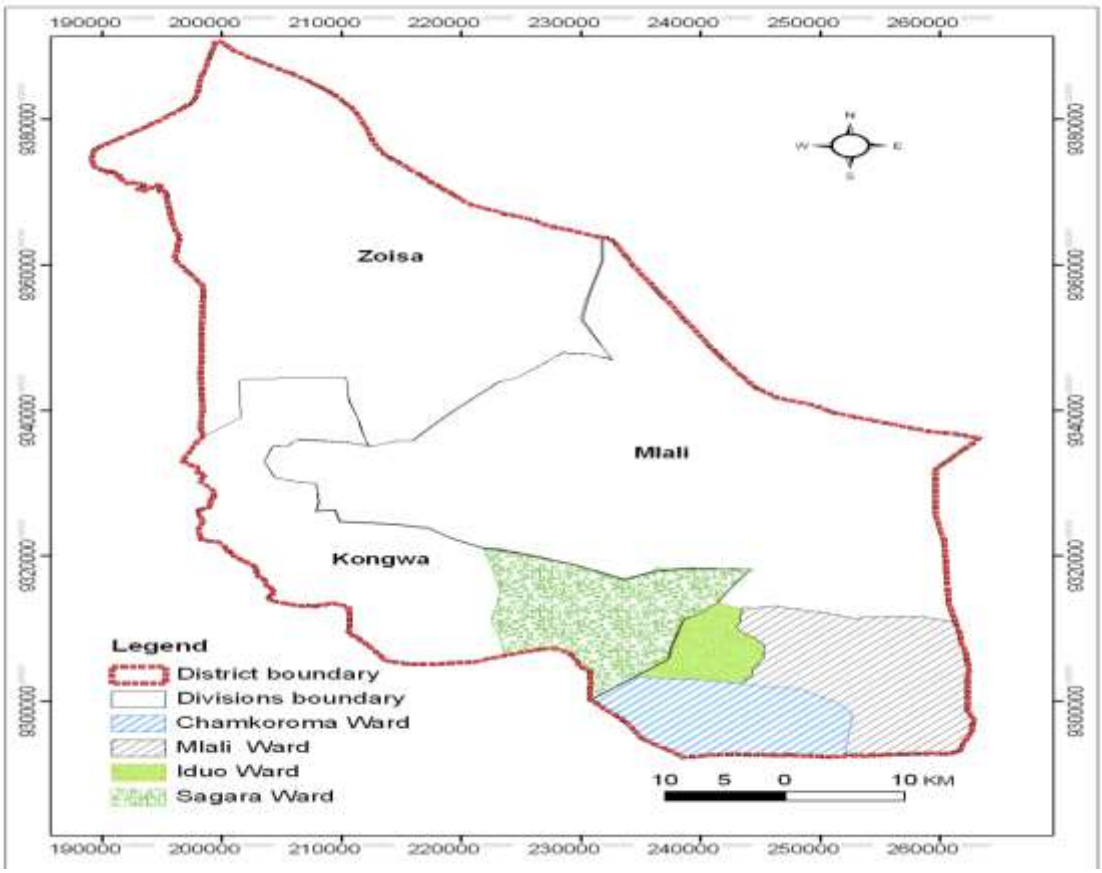
In general terms however, agriculture is still poor. Productivity is low due to several reasons including; low and erratic rainfall, high rate of vapour-transpiration and low moisture holding capacity of soils. Farming is characterized by poor methods of farming, poor technology, overstocking and overgrazing which lead to land degradation resulting from loss of vegetation cover (URT, 2013b).

The total arable land in the district is 363,691 hectors, and about 258,690 hectors (71%) are under actual use. There is a total of 5811 hectors of land suitable for irrigation, but only 295 hectors (5%) are irrigated using traditional method of canal irrigation.(URT, 2013b). Livestock form an important part of household wealth. They provide and essential source of income and they constitute a main means of wealth saving.

Infrastructure

The district is served by the main trunk road that connects it to Dodoma regional headquarter and Dar Es-Salaam via Morogoro. The district has numerous feeder roads which connect all the villages. They all have earth surface and are passable throughout the year although with some difficulties especially during rainy season. Kongwa town centre is connected to the national electricity grid line and is also served with several mobile phones companies (URT, 2013b).

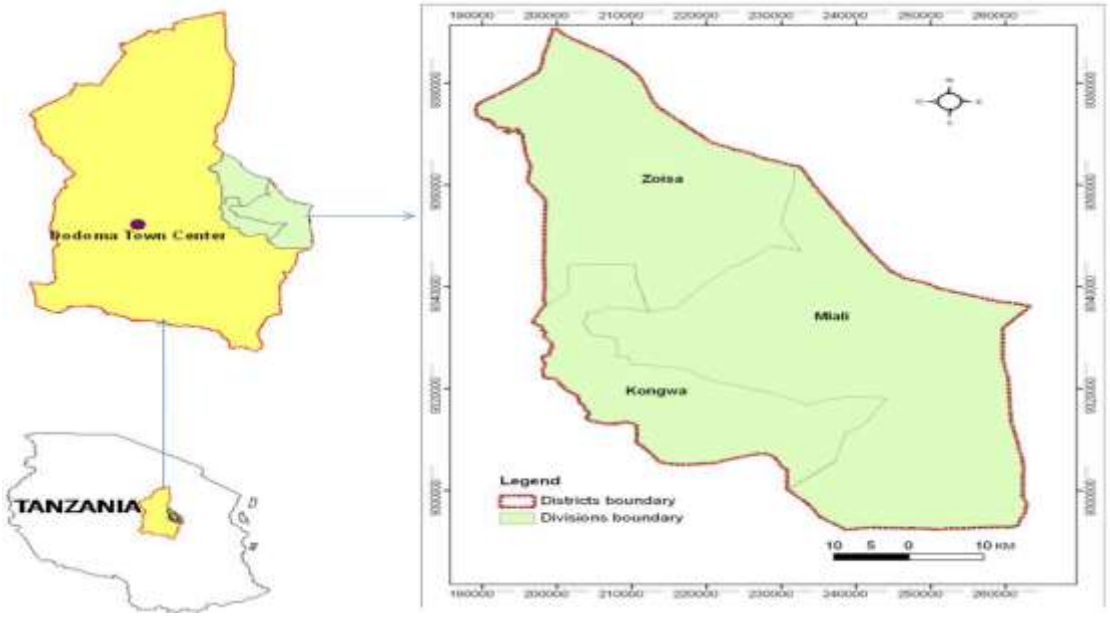
Figure 1.2: Map showing a geographical area (4 wards) covered by the study in Kongwa District



Source: A adopted and modified from (NBS, 2012)

Generally, Kongwa District remains one of the districts in Dodoma administrative region that is marked with low incomes and extreme poverty among its inhabitants (URT, 2007a; WFP, 2013). The low level income to the majority households is attributed to poor agriculture which is the main economic occupation of many people in the area. Contract farming was introduced in Kongwa District in order to improve production and marketing of sunflower a crop that is exclusively meant for cash earning for most households in the area. Maize production is another important crop which serves both as cash earning crop and a staple food of people in the area.

Figure 1.3: A study area and other related geographical areas.



Source: A adopted and modified from (NBS, 2012)

1.6.2 Methodology

An Overview

This part describes the methodological aspects of this thesis. It presents the research design used and the methods of data collection and analysis used. Lastly, this section presents research limitations encountered by the researcher.

Research strategy

The process of carrying out this thesis began with identification of the ideal areas i.e. areas where sunflower is widely grown by smallholders and where CF system is practiced. Area identification survey trip was conducted in July 2011, which took a researcher to Dodoma and Singida regions; the areas well known for their substantial production of sunflower under smallholder production system.

Research Design

This thesis used a cross-sectional research design. This is a survey design, which enables a researcher to collect information at one point in time and make a snapshot of state of affairs (situation) in regard to the population under investigation. This design is often meant to overcome the problem of time and resource restrictions during the field survey (Saunders, Lewis, & Tornhill, 2003; Walsh, 2001). The field survey for this thesis took three months although not consecutively, the farm level survey took two months while the value chain survey took one month as explained in the following section.

Data Requirements

Data for this thesis were collected in two phases. In phase one farm-level data, both primary and secondary data were collected. The survey took place from September to October 2012. Primary data were collected in single visit interview to target groups, the sunflower farmers, and other stakeholders in the sunflower sub-sector.

Primary information collected in the first phase was mainly on production and marketing conditions in sunflower sub sector. These data ware used to address the research objectives number one, two, and three which were outlined as being to understand contracts practiced in the area, to measure of the technical efficiency and income effects of contracts.

As for secondary data several reports were used that provided an overview of the sunflower sub-sector in Tanzanian. These included various documents prepared by RLDC and SNV, the most active private NGOs acting in the sub sector, and research report by Ilonga Agricultural research Institute.

Phase two of the study took place between June and August, 2013. It involved conducting interview with selected sunflower processors in Dodoma and Singida. Data collected in phase two intended to address mainly the research objective number four. Informed by the initial findings, this phase intended further to

understand the sunflower value chain and its dynamics, that is, how effective are agro industrial firms in enhancing coordination of the crop value chain through contract farming. Both primary and secondary data sources were used.

Population and sampling

The survey involved 400 small scale sunflower farmers in the district. A multi-stage stratified sampling procedure was followed in selection of households. In the first stage 8[3] villages in four wards were purposefully selected based on the prevalence of contract farming.

In the second stage, a sample was drawn by a stratified random sampling method whereby 205 contract farmers were randomly selected from the list of contracted farmers provided by the agents of the two contracting firms operating in the area: *Company A*[4] and *Company B*. In 5 of the 8 villages, 30 contract farmers[5] were randomly selected from village based on the respective village households' lists of contract farmers available with the companies' agents. From the other two villages 15 contract farmers were randomly selected from each of the two, and 25 were randomly selected from the 8th village.

For comparison purpose 195 non-contract farmers were randomly selected from the same villages based on the village households lists available at the village executive offices (VEO).

[3] Village1 Suguta, village2 Iduo, Village3 Masinyeti, Village4 Chamkoloma, Village5 Tubugwe Kibaoni, Village6Laikala, Village7 Ijaka, Vilage8 Ihanda

[4] The names of the companies are not mentioned, and are changed into *CompanyA* and *CompanyB* throughout the chapter.

[5] Grinnell (2001) suggests that, a good sample size need to have a minimum of 10% of the total population or 30 units(respondents) from each of the clusters in the population e.g. villages, depending on which is bigger.

Table 1.1: Populations and Sample

Name of the village	Total households in contracts	Sampled households in contracts	Total number of non-contract households	Sampled non-contract households	Total number of households in the village
Suguta	77	22	345	18	422
Iduo	190	29	475	31	665
Masinyeti	100	31	353	27	453
Chamkoloma	250	30	1670	30	1920
Ihanda	60	31	704	32	764
Tubugwe	110	32	594	28	704
Ijaka	37	15	774	15	811
Laikala	60	15	807	14	867
Total		**205**		**195**	**6606**

Source: Research data, 2012

A well-structured questionnaire was administered to household heads. The questionnaire used included questions on household characteristics, assets, crop production and marketing, input source, costs, contract participation and the terms of contract. Four trained enumerators were assigned to administer the questionnaires to the farmers. It was a face to face interview and close supervision was made to make sure the interview worked out well. Four hundred questionnaires dully filled, provided basic data for analysis of this study.

Information obtained through the questionnaires was further validated by means of observations and unstructured interviews with the key informants, the village leaders and the company representatives who happened to be the villagers and sunflower farmers themselves. The secondary source of information has mainly consisted of various documents prepared by RLDC and SNV, the most active private NGOs acting in the sub sector.

During phase two of the study survey, sampling was purposeful based on considerations that a processor had operated contract farming at least once in the previous three years. There were 9 processors engaged in CF in 2010/11, 13 processors in 2011/12, and 7 processors in 2012/13 (Ringo, 2013). This study surveyed 7 processors including 6 processors who were still operating contracts and one processor who had stopped contract farming in the immediate past year.

Interviews were carried out with selected processors, key informants from (forums) organisations advocating for development of sunflower value chain in the region and the country. These included the Central Zone Sunflower Oil Processing Association (CEZOSOPA) and the Tanzania Processors Association (TASUPA) and the NGO widely involved in smallholder sunflower business, the Rural Livelihood Development Company (RLDC).

Data Collection

A questionnaire designed by the researcher[6]from January to April 2012, was field tested in the month of June 2012.It was noted that the interview lasted between 50 and 60 minutes for each respondent. The duration was quite satisfactory because a period longer than this often leads to impatience on the part of the respondent (Iarossi, 2006). The questionnaire was corrected and amended accordingly.

During the months of September and October 2012, the questionnaire was administered with the help of four enumerators, who were the immediate ex-students of IRDP-Dodoma, who prior to data collection exercise had undergone a well-designed training on what kind of data to be collected and how to collect it, in a four day seminar held at Mzumbe University from 21-24 June, 2012. These enumerators in addition had completed their own final year research projects as per IRDP's rules in fulfilling their degree completion requirements. So, they were familiar with research ethics and practices.

The questionnaire was administered once for each household head, and the household head relied on his memory to provide answers. The four enumerators managed to conduct face to face interview with 400 households growing sunflower in 8 villages under the strict supervision of the researcher.

[6]The survey questionnaire was constructed by the researcher with the help of supervisors at Copenhagen University in Denmark under the sponsorship of DANIDA Fellowship Centre through Tanzania-Denmark Pilot research Programme, Project 10-P11-TAN.

During value chain survey data collection, both structured and unstructured interviews were used. Structured interviews were used to obtain answer for specific issues while unstructured interviews were used to obtain broad and free views of respondents on issues of interest. As the number of respondents was small, the researcher himself administered the questionnaire on face to face basis. The interview lasted about one hour and it was quite satisfactory.

Individual respondents were interviewed in their homes or business places, offices or selected places after an initial appointment. Appointments were made at least few hours or one day before the interview date. The objectives of the study were explained to each respondent prior to interviews in order to create good understanding between interviewer and interviewee. Respondents were interviewed once and their responses were recorded directly by voice recorder.

Data Processing and Analysis

Data processing involved data cleaning, coding, and entering data in the computer. The analysis of data took into account the fundamental need to address the study objectives. The objectives of the study were as spelled in section 1.3. Method of analysis for research objective number one entailed the qualitative analysis of the production contracts following a holistic approach to contract theory proposed by Bogetoft and Olesen (2004), where the analysis of the performance of contracts as formulated in the first research objective number one is carried out basing on three main concepts; namely the Coordination, Motivation and Transaction costs minimisation issues guiding contract design.

A stochastic frontier analysis (SFA) model is used to determine technical efficiency and identify factors influencing technical efficiency of farmers, while Propensity Score Matching method (PSM) is used to investigate contract participation and measure the actual effect of contracts on technical efficiency and productivity of farmers as stated in research objective number two, and the treatment effect model is used to determine contract effect on income of sunflower farmers as per research

objective number three, where a statistical software, STATA version 11,was used in data analysis. A value chain analysis frame work was used to scrutinise firms' capacity to coordinate the crop value chain development through contracts.

1.7 Research Limitations

The researcher encountered the following difficulties in the course of undertaking this study; firstly, lack of precision in the statement of some figures by farmers. This was partly attributed to lack of habits of keeping records among small scale farmers. So they relied very much on their memory to state information (statistics) asked.

To make sure reliable data on variables of great interest like revenue were obtained in the end, information was separately sought on key general variables like the price at the time of sale of produce and the number bags sold. With such useful information it became possible to determine a more correct revenue figure by simple computation instead of relying on self-reported revenue figure. The technique of asking questions separately about specific variables like price and quantity sold and costs of separate farm and marketing activities there after generating own statistics helped also in obtaining more reliable data on farm income.

Secondly, some respondents, particularly private firms had their own suspicions, that the study results could be used by the government to collect information aimed at imposing tax. This in effect resulted into lack of willingness for some respondents to respond to some questions especially on firm annual turn overs. To overcome such problems the researcher consistently insisted that the exercise of data collection was for research purposes only and assured them that this study would not affect them in any way and there was nothing to fear about.

Additional method of data collection, mainly that of making informal personal interview with plant owners was used to allow for triangulation of information from the formal interview, to increase the reliability of data and the study.

1.8 Organisation of the Thesis

This thesis is organized into six chapters as follows; Chapter 1 provides introduction and overview of the thesis. It introduces contract farming theoretical debate which constitutes a theoretical foundation of this thesis. It then describes the overall objectives of the study and outlines the specific research objectives, research questions and study methodology. Chapter 2 focuses on specific objective number 1, it describes and analyses characteristics of contract farming practiced by sunflower farmers in Kongwa district based on holistic approach to contract theory framework. Chapter 3 and 4 measure using propensity score matching method and the treatment effect model, the effect of contract farming on technical efficiency and income of farmers respectively. Attention is equally given to factors influencing participation of farmers into contract farming.

Chapter 5 concentrates on specific research question number 4. It undertakes to explore the power or ability of small and medium local sunflower oil processing firms to coordinate the sunflower value chain through contract farming. Characteristics of processors are analysed, and factors determining success or failures of contract farming are identified given the market conditions under which they operate. Chapter 6 presents a summary, conclusion, and policy implication derived from research findings.

CHAPTER TWO

CONTRACT FARMING OF SUNFLOWER IN KONGWA DISTRICT

2.1 Introduction

This chapter addresses contractual issues under the present contract farming system in Kongwa District. It examines how sunflower production contracts are formulated and coordinated to address their general inherent contractual problems such as hold-up, side-selling and risks in production and marketing such that both parties involved achieve the stated shared objectives of contracts.

The analysis is founded on the conceptual framework of multi-criteria decision making. Designing of a contract is considered a multi-criterion decision making problem, which requires a simultaneous considerations of all aspects of contract (Bogetoft & Olesen, 2004; Wu &Reo, 2006). Thus, contracts are analysed on the basis of the concepts of coordination, motivation, and transaction costs. The holistic approach to contract analysis is applied.

In the course of analysis, comparison is made between contract and no-contract farmers on outcomes of interest common to both contract and non-contract farmer groups for which data were collected. They include outcomes such as acreage under sunflower production, share of land under sunflower production to total household land, use of improved inputs, productivity, and total output, the aim is to establish whether contracts are able to address the inherent contractual problems and generate advantages to contract farmers if compared to non-contract farmers.

2.2 The backdrop to contract farming

Prevalence of CF in production of sunflower in Kongwa District is quite significant. The increasing demand (i.e. growing market) for locally produced sunflower oil is driving almost all famers into production of sunflower and CF is increasingly becoming a popular way of organising production and marketing of sunflower. Agribusiness firms, particularly the oil processing firms are attracted into this

sunflower business, which is offering a growing opportunity for profit making. CF is an arrangement that is currently favoured by these firms.

Contract farming system has attracted both farmers and processors because of its potential capacity of solving several of the problems faced by both parties (i.e. producers and buyers) in production and marketing of sunflower produce. Small scale sunflower farmers in Kongwa, like small farmers in other parts of the country (URT, 2009), face a number of constraints that limit their efforts in improving production and marketing of their agricultural produce for the purpose of increasing returns from their farm works.

Most farmers lack inputs such as improved seeds, fertilizers, technical assistance and they experience uncertainty related to market outlets and prices. On the other hand, processors lack reliable way to secure steady supply of adequate quality seed (raw materials) to ensure continued production of edible oil with their mills.

The use of contracts in production of sunflower in Kongwa District began in the 2007/08 crop season. Contract farming was introduced in the sunflower sector in Kongwa District as a way of improving business related to sunflower production and marketing. It was introduced separately by two private firms; *Company A* and *Company* both based in Dodoma Urban District (RLDC, 2012). Each had its own separate area of operation. One NGO, the Rural Livelihood Development Company (RLDC) also based in Dodoma town facilitated in setting up of these contract projects by developing a cooperation framework between firms and farmers.

The Contractual arrangements aimed at building better commercial relationship between small-scale farmers on one hand and the two main buyers on the other hand. Contract farming arrangement meant to address major problems often facing smallholder farmers in the area, the most critical ones being lack of improved varieties of seed and lack of reliable profitable market for sunflower produce. It also aimed at improving access of farmers to extension services and better agronomics specific to sunflower production.

In was envisaged that, provision of training and assistance to farmers by contracting firms would promote quality and quantity of sunflower produced, and would enhance commercialization of smallholder production for increased incomes at household level (RLDC, 2010, RLDC, 2012).

In spite of contracts, it is still a common observation that the majority of farmers are poor and are still compelled to produce sunflower at subsistence scale, working on small plots with farm size ranging 1 to 3 acres per household and using poor inputs and tools.There is noticeableinadequate use of modern agricultural knowledge and technology, for example, it was observed from the field during pilot survey (POLICOFA, 2010), that seed (improved variety) was the only input provided in current contract arrangements. There was nothing about such other inputs like fertilizers, credit, and pesticide, which are equally important for better sunflower production.

In addition, farmers appear to potentially produce low not only because of factors external to them but also because of their inefficiencies. Much of the increased production seems to arise from the increasing cultivated area rather than increased productivity.

On account of this background, it is imperative we understand the kind of contractual relationship which exists between the contracting parties, and the kind forces governing the relationships. This helps to establish the cause and effects of contract agreements and the options available for reducing contractual problems between parties to make contracts more reliable and useful tool of improving production and income of smallholders. `

Generally, CF is not limited only to Kongwa and sunflower crop and it is not a new phenomenon in the agricultural production system of Tanzania; although traditionally confined to few cash crops, it has been practiced since colonial times (TNBC, 2009), where crops such as cotton, tobacco, sisal and coffee were involved. It has also been practiced in form of outgrower schemes in sugarcane production in

Mtibwa sugar estate and Kilombero sugar estate in Morogoro region and other areas producing sugarcanes.

Currently, contract farming is growing popular in commercial production of crops other than traditional-nonfood cash crops. It is being widely adopted by small scale farmers who grow on commercial basis crops like sunflower in central areas of Tanzania that is; Dodoma, Singida and Manyara, and Irish potatoes in Mbeya. On the one hand, the growing trend in increased use of farming contracts follows the government support of the idea.

In its Agricultural Development Strategy (ASDS) drafted since 2001 with its subsequent Agricultural Sector Development Programme (ASDP), which became operational since 2006, the government has stressed the need to increase vertical integration, where contract farming is specifically mentioned in order to address farmers' problems of production and marketing in Tanzania (URT, 2003). In Kilimo Kwanza (URT, 2009a), the government further underlined the importance of contract farming, by stressing the need for drafting laws to guide and protect contract farming system in Tanzania. It emphasizes the need of establishing institutional arrangement with particular importance attached to contract farming, as stipulated in pillar seven (URT, 2009; URT, 2009a).

The private sector in Tanzania too, finds CF to be an important reliable approach in transformation of agriculture sector compared to other institutional arrangements such as integrated producer schemes and farmer cooperatives that have been tried in the country. The private sector sees CF to have the potential of serving as a basis for

Public-Private Partnership (PPP), linking smallholder farmers to the commercial farmers and also linking the smallholder farmers to the markets and value chains (TNBC, 2009).

Key aspects considered important by the private sector regarding CF include;

i. The extent to which smallholder farmers are involved in contract negotiations on important issues like price setting.

ii. Presence of essential services to support farmers and buyers.
iii. Evidence of clear role of Local Government Authority (LGAs).
iv. Evidence of regulatory role for the crop under consideration.
v. Impact of the CF scheme on Socio-Economic well-being of the smallholders (TNBC, 2009).

The major current issues of concern regarding CF as identified by the sector include;

i. Smallholder farmers are generally takers of price and other contract terms.
ii. The role of LGAs is not well articulated in facilitating CF in their respective areas.
iii. The existing regulations (licenses, permits, levies) have focused more on buyers and less on producers.
iv. There is lack of clear agreements on penalties and bonus and arbitration clause in the existing contractual arrangements, which as the result there have been problems of side selling by contracted farmers and uncertainties in contract terms especially price and price arrangements. On the whole, the private sector see there is lack of cohesive approach to CF in Tanzania (TNBC, 2009).

On the whole, the private sector considers the impact of CF in agricultural development and well-being of the smallholder farmers as generally positive aside the fact that there are no clear guidelines as to how CF should be framed (TNBC, 2009).

The government of Tanzania on the other hand, envisions in its economic plans to facilitate and empower the private sector such that it becomes the engine of national economic growth and development (URT, 2011b). Interest in contract farming is also growing out of the dying faith of many small scale farmers in farmers' cooperatives. Cooperatives were once the reliable form of farmer organization in Tanzania, but following their failure to address and safeguard the pertinent interests , farmers have lost faith in them, and other forms of producer organization have emerged such as

farmer groups, Saving and Credit Cooperative Societies (SACCOS), small scale farmers networks e.g. *MUVIWATA* beside contract farming system (URT/FAO, 2008).

2.3 The theoretical framework

The standard model for analysis of contract farming (CF) with respect to smallholder farming is the Principal-Agent Model (Laffont & Martimort, 2002). According to this model, there exists agency relationship when there is a contract under which one person, (the principal) e.g. the processor engages another person (the agent/s) e.g. a smallholder farmer to produce a crop (e.g. sunflower) on his/her behalf, which involves delegation of some decision making authority to the agent (Gardner, 2003). Such delegations, however, mean also that the principal needs to place trust in agent to act in the principal's interests. If both parties to the relationship are utility maximizers, it will always be expected that the agent will not act in the best interest of the principal. Given the asymmetry of information and self-interest of the agent, the principal lacks reasons to trust the agent, and will always make efforts to resolve this concern by designing incentive-based contracts that can induce the agent to undertake actions that will maximize the principal's welfare even in the physical absence of the principal.

The Principal Agency Model is thus, concerned with the design of optimal incentive schemes such that contracts are able to align the interest of agent with those of the principal and reduce the scope for information asymmetries and opportunistic behaviour, (Shapiro, 2005). Two assumptions underlie the general principal-agent model. The first one is rationality. Individuals are depicted as being rational, such that they choose the best means to pursue their goals given the information they have. Under perfect rationality assumption, a contract can provide solutions to all contractual problems including all future contingences which can be foreseen. There is no need for re-negotiation of contracts and there is no need for third party like government intervention, as these would constrain some activities leading to inefficiencies (Wu &Reo, 2006).

This extreme situation, however, is usually unlikely. On the other hand, under imperfect rationality, it is assumed that individuals can not foresee all possible states of nature. Individuals who are parties to the contract in the meantime cannot specify the actions for all the possible future contingences. And, even if that were possible, costs of making and administering such contracts would be excessive. Contracts therefore are at any one time incomplete, and re-negotiation will always be required, Hart (1995) as cited in Bogetoft and Olesen (2004) and as discussed in Wu and Reo (2006).

The model is also based on the assumption of opportunism, where individuals are shown as being self-interested, and are assumed to exploit the situation they face for their own benefit. An individual will keep his commitment in contract only if he benefits from it, otherwise, he will seek to improve his position by withholding information, by misreporting or by not acting according to the agreements (Williamson,1996), as cited in Bogetoft and Olesen (2004).

The basic Principal Agent Model is usually a simple model that depicts the problems or difficulties of establishing contractual relationship. In its explanations the model focuses on the existence of informational problems in contracting process between two self-interested parties with divergent interests when they are differently informed. It explains the costs generated by the informational problems and how they can be minimized. It underscores the existence of two general problems known in creating contracts between the principal and the agent in situation where they are unequally informed. These are problems of moral hazard and adverse selection.

While the Principal Agent Model satisfactorily addresses the contractual problems of dishonest and lack of motivation in designing and implementation of incentive driven contracts, it fails to address other important aspects of a contract which include; coordination, motivation and cost minimization which emerge in practice of contractual relationship and which are critical and worth considering when designing and implementing a contract aimed at maximizing the integrated profit.

Moreover, the model that assumes a simple one-input, one output production condition is unrealistic compared to practical contracts. It fails to provide sufficient guidance for understanding of multi-decisions made in practical contracts (Bogetoft & Olesen 2004). A more augmented contract theory as advanced by Bogetoft and Olesen (2004) propose a holistic rather than partial approach in understanding contractual relationship in agricultural production. This takes a systems view of contracts.

2.4 The holistic approach to contract theory

In this approach, a contract is based on the conceptual framework of multi-criteria decision making (Bogetoft & Olesen, 2004; Gibbons, 2005).Designing of a contract is considered a multi-criterion decision making problem, which requires a simultaneous considerations of various aspects of contract. It is critically argued that, the analysis of farming contracts basing on the Principal-Agent Model is limited in that, it entails a partial approach to analysis of contracts in which focus is on one e.g. profit margin or just few issues. It is further argued that partial analysis may not be satisfactory because investigation of one issue may be associated with another issue which will not be captured in partial analysis set up. Also the analysis may wholly focus on minor problems e.g. price fluctuation while it ignores the more important issues e.g. the overall macro-economic environment (Bogetoft & Olesen, 2004).

Thus, a holistic approach to contracts isa broad frame work of access to production and marketing facilitation which hold the view that contract farming goes beyond sales agreement and requires a comprehensive package and not only sales agreements or few components of contract agreement. It entails development of a systemic view of the chain which recognizes and values the interdependence of the actors in all aspects business operation. (Will, 2013).

The overall goal of contract

In a holistic approach to contract (Bogetoft & Olesen, 2004) or complete approach to contract(Gibbons, 2005;Wu, 2006), it is argued that, there may be other reasons, but

the main economic reason why parties sign a contract is to maximise the integrated gain (i.e. sum of gains of all contracting parties). The intuition behind seeking maximum gain is that, with a large total joint gain each part can become better–off, provided it is possible to redistribute the gain/profit without undesirably affecting the favourable behaviour of the contracting parties. Contracts leading to such maximum unified profit are termed as Pareto efficient contracts or complete contract capable of governing every aspect performance (Wu, 2006). They are desirable contracts which can be achieved through bargaining if property rights are well defined (Hart& Moore, 1999).

The role of contract

The contract therefore has roles to do to ensure maximum integrated gain is realized. According to Bogetoft and Olesen (2004) there are three fundamental roles which the contract must fulfil. Firstly; contract must coordinate production and marketing. Secondly; contract must motivate parties, and lastly, contract must minimize transaction costs.

1.4.1 Coordination

Coordination of production and marketing, which may be performed by means of price mechanisms or by direct instructions or a combination of both, has the purpose of making sure that, right producers are recruited for contract, and right quantity of quality product is produced at the right time and place (Bogetoft & Olesen, 2004; Singh, 2002). Coordination is meant to ensure that there is no sub-optimal production resulting from decision makers who choose to optimize their own decisions without considering all the consequences for other decision makers in the production chain.

Aspects of coordination in a view of holistic approach include; making sure that production process and marketing costs are minimized, for example that the farmers recruited for contract are those with lower marginal costs. Furthermore, coordination needs to reduce production risk. It is suggested for example that contracts need to be adjustable (*ibid p.49*). Adjustable contracts allow and encourage parties to the

contract to make mutually attractive adjustments in production and marketing plans. This is where for example; product prices are allowed to vary with production costs. Fixed product prices under non-adjustable contracts deny producers the right to benefit from any market price increase. This adds to production risk when costs of production vary.

Coordination also entails making sure that, risk of production and marketing is not only minimised but also fairly shared between parties such that the cost of bearing risk is borne in a cheapest way. It is suggested that parties to the contract who are less risk averse should bear more risk. Processors are considered less risk averse because they can diversify their investments and should be able for example to offer fixed premium price, farmers on the other hand have limited opportunities of diversifying their investments, and they are thus, more risk averse and should be assisted in bearing the risk (Wu, 2006).

A caution is given however, that risks sharing arrangement need to take into account the conflict between efficient risk sharing and motivation. It is argued that, processors should bear in mind that, while they have a duty to ensure input supplies to producers, they should guard against generation of moral hazard behaviour by producers from such investment decisions. To ensure incentive comparability, the parties can introduce monitoring system and opt for reward and penalty mechanisms (Bogetoft & Olesen, *ibid*, p.49-55). Coordination also has to do with general organisation of production, to see to it that parties are linked well and the linkage is likely to expand.

1.4.2 Motivation

Another role of contracts is motivation. Contracts need to ensure that parties to the contract are motivated and have strong individual interests to make coordinated decisions that maximize the integrated profit. It is assumed that, individuals are opportunistic. They can act as planned and reveal their private information only if it is in their interest. Thus, motivation is needed to align the interests of the

independent parties to the contract to ensure integrated profit is maximized, (Bogetoft & Olesen, 2004). Incentives with strength should be designed and used such that parties can still take right actions even in situation where they are not observable by the other part or cannot observe each other.

Motivation seeks to ensure that appropriate farmers, who are motivated and efficient, self-select into contracts. Given the likely problem of overcompensation (information rent) likely to arise from adverse selection and the limited power of discriminating on the side of the buyer/processor, three options are theoretically proposed to prevent selection of bad (high cost) producers; one is lowering payment, such that producers with high cost of production choose not to participate. So, only fewer but better farmers will join contracts.

Second technique entails conditional payment such that payment depends on level of output. This ensures that a high payment is accorded to producers with large output, who often have lower production costs. Better farmers are more likely to be attracted to these arrangements than weak farmers (expecting low yield). The processor can often attract efforts of producers by increasing the incentive intensity, which is the degree to which payment depend on performance. The rules as stated in (Bogetoft & Olesen, 2004) are; more incentive should be directed to increased efforts if additional efforts generate higher profit; and incentive should be stronger the more risk tolerant the producer is; equally, incentive should be stronger the more the producer is able to respond to them, if for example payment is made to depend on level of output. Another suggested way entails a processor offering a menu of contracts such that farmers are attracted to different contracts according to their production characteristics.

A motivational contract needs to ensure that optimal efforts are provided from independent parties to the contract in implementation of production plan. Given that producers and processors are independent decision makers looking out for their own interests, there must be ways to ensure that, the producer provides maximum efforts, as he implements his part of coordinated production plan. With rewards and penalty

mechanisms, the processor increases payment when he sees positive signal (e.g. expanded field or increased use of recommended (seed variety) about the producer's effort, or terminates the contract when he sees the signal that the producer is not making enough effort. Indicators could also include expanded farm sizes of the producer compared to average farm holdings of all producers in a season in the area.

There is an issue with robustness of contracts. This is the ability of contracts to work well under changing conditions, for example in both good and bad years. This is important to ensure continued efforts of producers. It should be that, motivated parties are willing to increase efforts in forward planning, and are willing to expand their investments.

Contracts need to ensure that problems such as hold-ups are minimized or eliminated altogether. A processor can hold-up the producer by lowering payment after the producers have made relationship specific investments. The producers can hold-up processors by demanding a higher payment. Fear of hold-up problem on either side of the contract parties may lead to underproduction or under investment. Thus, under motivation considerations, contracts seek to prevent exploitation of one party by the other when one is locked-in by specific investments (Bogetoft & Olesen, 2004).

1.4.3 Minimization of Transaction Costs

Finally, contracts need to satisfy the goal of minimising transaction costs as Bogetoft and Olesen propose, (*ibid*, p.65-69). Costs of concern are those related to socialisation process to draw interests of farmers towards proposed contracts, negotiation of contracts, writing of contract, conflict solving, monitoring and all other influencing activities, but also those related to off-market transactions like costs of motivation and coordination.

Negotiations of contracts which do not give guideline for every situation lead to incomplete contracts which will require subsequent negations. Costs of this nature can be reduced by minimizing the number of negotiations, and by using standard contracts. As for conflict resolution costs, it is suggested that parties agree on

principles or procedures for settling conflicts e.g. the use of arbitrator. The other method may be that of submitting the conflict to another authority trusted by both for resolution. Monitoring involves direct costs in terms of wages to the inspectors and communication costs. These costs need to be balanced against the gains of monitoring.

2.5 The analytical framework

To address the issues of how contracts between smallholder farmers and processors in sunflower production and marketing in Kongwa district are determined, enforced and contractual problems addressed, the analytical framework based on the above narrated holistic approach is then applied. This is a broad frame work of access to production and marketing facilitation as explained in section 2.4. This framework enables explanation and analysis of different strategic interactions between farmers and processors and other actors aimed at maximizing the integrated gain based on the themes of coordination, motivation and minimization of transaction costs.

2.6 Results and analysis

This section presents the results and analysis on how the present contracts practiced in production of sunflower are determined, enforced and used to address general challenges inherent in contract farming such as production synchronization, production and marketing risks, moral hazard, and hold-up problems by examining the underlying mechanisms of coordination, motivation and cost minimization. Comparisons are drawn on selected variables of interest between contract and non-contract farmers to establish if there are any advantages that may be associated to a situation of a farmer being in contract.

The expectations were that, the goodness and usefulness of contract farming arrangement would be reflected in better situations under which the contract farmers operate, implying that contracts have been good at coordination, motivation and cost minimization in production and marketing processes.

2.6.1 Description of the contract farming

Sunflower production contracts in Kongwa District began in 2008/09 crop season, as an initiative of three private companies based in Dodoma town namely; Rural Livelihood Development Company (RLDC), *Company B*and *Company C*. These companies organized mobilization seminars in different villages in the district. The RLDC helped in designing of contract farming arrangements and facilitated these seminars. Contract by design rather than default, was perceived by RLDC and contracting firms, would reduce risk of contract arrangement failure and make CF a viable undertaking.

Through these seminars, the companies proposed contract scheme to farmers in production of sunflower in the area. The information and knowledge gained from these seminars convinced some farmers to join contracts. Most farmers were motivated by the pronounced terms of contract in which contract farmers would be guaranteed with market outlet for their sunflower produce, and support in terms of inputs and farm implements such as seeds, ploughs, and canvases.
In summary contractors promised (as outlined in the contract documents);

a. To establish sunflower marketing center in the village.
b. To facilitate formation of farmer groups.
c. To buy all sunflowers produced at the going market price.
d. To facilitate and finance farmers' demonstration plots in the selected villages e.g. Ihanda village.
e. To extend appropriate knowledge through seminars on proper sunflower agronomics and contract farming arrangements.
f. To provide a credit at5 percent of the amount of money a farmer would need for activities such as tilling of land, and purchasing of fertilizers.
g. To provide production inputs such as improved seed variety e.g., r*ecord* at a cost.

Farmers on the other hand, would be required in turn, to produce more sunflowers and sell to the firms at least 50% of the total produce. They would also be required to keep all other agreements.

CF was adopted with great enthusiasm by many farmers when it was introduced in Kongwa district. It was considered to be an arrangement that represented a practical framework for access to production and marketing facilitation. Mutual relationship between producers and private companies is always crucial and need to be developed for successful collaboration. Thus, the adoption of contract farming as a tool of collaboration in the study area intended to achieve productive and fair relationships between producers and buyers of sunflower (RLDC, 2011).

Rural Livelihood Development Company (RLDC)

This is a very important organisation in formulation and operationalisation of sunflower contract farming. This is a non-profit organisation funded by Swiss Agency for Development and Cooperation (RLDC, 2012). The main activities performed by the organisation in sunflower sub-sector can be summed as follows;

i. To work in partnership with other stake holders of the sector to address the production and marketing constraints facing sunflower farmers and processors. The company has developed a broad array of stakeholders including the local government authorities (LGAs), business, banks and farmers' organization and they have jointly worked to improve sunflower business environment.
ii. To give temporary support with sustainable impact e.g. by subsidizing market function such as inputs and services, when it is clear who will pay for them after the project ends.
iii. Strengthening advocacy for business environment improvement by supporting lobbying and advocacy activities of sector associations such as Tanzania Sunflower Processors Association (TASUPA), Tanzania Edible Oil Actors Association (TEOSA), and the Central Zone Sunflower Oil Processing Association (CEZOSOPA).
iv. To facilitate alliance formation between farmers, processors and other stakeholders who may be interested in the sector development.
v. To propose convincing business model of development such as contract farming system, local seed multiplication projects to improve seed

availability and accessibility at farm level and enhance production and productivity of sunflower.

vi. To facilitate oil processors (through their association CEZOSOPA) in improvement of quality, volume and marketing of sunflower products (RLDC, 2012; RLDC, 2010).

RLDC has been an important sector change agent through its facilitation activities and some positive effects on both production and marketing are recorded. The company fosters development of appropriate agreements so that eventually, parties to contract (farmers and firms) work on business principles as trust and business experience develop.

2.6.2 Coordination

The overall objective of sunflower production contracts in Kongwa is to increase total sunflower output and incomes of farmers in the area. Farmers sign contracts to obtain seed, (better yielding variety, *record variety*), land preparation support and market outlet for their produce. Firms on their side sign contracts in order to secure steady supply of needed produce in right quantity in right time at right costs.

Coordination of production entails selection of good/productive farmers, monitoring of different stages in plant development from farm preparation to harvesting stage, to ensure satisfactory quality and quantity of yield at the end without incurring excessive direct production and labour supervision costs. It also means improving returns for farmers at minimum possible costs.

Prime issues which contracts attempt to solve through coordination are; low quantity produced, low input availability, low quality of the produce and product market and price uncertainty. Meetings held between contractors and farmers in villages shortly before the season begins, serve as forums for information propagation, negotiations and delivery of contractual instructions regarding the rights and responsibilities of each part. Interested farmers self-select freely into the programme. Parties there after undertake separate tasks to ensure there is achievement of objects agreed as follows;

Contractor's tasks

i. Encourage more participation of famers into sunflower production contracts.

ii. Provide the certified seed or Quality Declared Seed (QDS).

iii. Provide credit.

iv. Provide training to farmers on proper agronomic practices required in sunflower production and related technologies. There were 8 local trainers of trainees (TOTs) in area covered by *Company B* and 2 TOTs in area covered by *Company A* to facilitate training of farmers in various villages. These were selected local farmers who initially underwent short time training on sunflower agronomics under the sponsorship of RLDC; they would seasonally or temporarily be hired by the two companies when farming season is due.

v. Appoint coordinators, these are charged with general inspection and projection and assessment of production in an area during a given season. They have also a duty of advising the contracting firms and the farmers before and during growing season. For each area of production there is one person who is usually a farmer in that area. He is given a motorcycle to facilitate his movements.

vi. During harvest, processors provide canvas to facilitate cleaning and collection, and arrange for temporary warehouses to facilitate storage during marketing (exchange). Only one permanent warehouse has been constructed by *Company B*in Ihanda village.

vii. Fulfilling an obligation of buying sunflower from producers.

The producers' tasks;

i. Allocate fields for sunflower production.

ii. Do the sowing.

iii. Do all crop husbandry until harvest.

iv. Repaying of credit seed in terms of seed produce.

v. Selling of produce to the contracting firm.

Contracts are simple and informal and they are made on one year basis. Present contracts are not legally binding and, their performances rely very much on trust and

respect between parties. As such, they can be best described as being relational. And as Lyons (1996) points out, relational contracts do not take into account all future contingencies, but are long-term arrangements in which past, present and expected future relations among contracting parties matter. Although contracts are signed on one year basis, they are continuous by way of repeating signing. Contracts are in written form although most farmers could not produce copies of their contract agreement document. This suggests there are some abnormalities regarding the existing contracts. Copies of such agreement were, however, available at the processors' site.

Acreage and quantity of sunflower produced

Contract farmingarrangements in Kongwa district have generally motivated farmers participation into sunflower production. According to records of the two companies involved in contract farming, there were over1200 households by the time of survey for this study participating in CF of sunflower in a total population reaching about 6000 households.

Farmers are assured of the market and they are paid instantly in cash for the quantity of sunflower produce delivered for sale. Buyer-supplied inputs (seed) reduce uncertainty associated with input availability, quality and costs. Most farmers are as a result increasingly growing sunflower on separate fields without intercropping with other crops.

Table 2.1: Allocation of plots for sunflower production

Type of farms	**Contract farmers**		**Non-contract farmers**	
	Freq	%	Freq	%
Separate plots	122	59.51	113	57.95
Intercropped plots	83	40.49	82	42.05
Total	**205**	**100**	**195**	**100**

Source: Research data, 2012.

Therefore, a large proportion of households with separate farms for sunflower production, 59.51%, and 58% among contract and non-contract farmers respectively,

against the intercropping households at 40.49% and 42% as indicated in Table 2.1, signify growing economic importance that is being attached to sunflower crop. Sunflower production is increasingly being accepted by many farmers as a viable commercial activity with attractive potential returns.

There is generally a great deal of intercropping among farmers in the area and the common intercropping pattern consists of sunflower, maize, and groundnuts. In effect, sunflower output tends to be lower where it is intercropped as can be observed from Table 2.2. Intercropping implies poor agronomics and undermines productivity of the intercropped crop.

Table 2.2: Yield in intercropped and non-intercrop farms

	Observations	Mean Yield in Kgs	Min	Max
Intercropped farms	165	302.9	9.9	2310
Non-intercropped farms	235	425.4	70	2520

Source: Research data, 2012.

Most sunflower producers as indicated in Table 2.3 are smallholders who own small farms with average sizes of 3.4and3.7 acres for non- contract and contract farmers respectively. Few farmers own up to 20 acres.

Table 2.3: The size of land under sunflower production

	Observations	Mean farm size in acres	Min	Max
Contract farms	205	3.7	1	23
Non-contract farms	195	3.4	1	30

Source: Research data, 2012.

Concentration of production is in the three administrative Divisions of the district which are Mlali, Kongwa Urban, and Zoisa in which the wards of Mlali, Chamkoloma, Iduo and Sagala are particularly the major producing areas. In general terms, sunflower production has been increasing from year to year even though with some fluctuations as can be seen inTable2.4, arising mainly from the variability in weather conditions (often drought).

Table 2.4: Sunflower production in Kongwa district from 2008-2012

Year	2008/9	2009/10	2010/11	2011/12
Quantity of sunflower produced(in tons)	3484	708	4128	3592

Source: DALDO, 2013.

The rise in production has been mainly due to growing market for sunflower products. The number of small and medium size sunflower oil processing mills has increased in the area. There are several mills in places like Mlali and Kibaigwa. Kibaigwa Township alone has over 10 small and medium oil millers. Mlali and Kibaigwa are important urbanized rural centres in the district with significant concentration of people and businesses. Besides, there are also larger urban centres of Dodoma and Morogoro, which serve as regional headquarters of the two regions and with municipality status in the neighborhood, with numerous micro, small and medium processing plants. Processing machines in these areas constitute the real market for sunflower producers. Farmers sell their sunflower produce to processors and traders or middlemen in these centres.

The market has also expanded taking a national scope; where traders are attracted from as far as Zanzibar, Dar- Es Salaam and Mbeya over 594Kms away[7]. These distant buyers collect both raw sunflower seed in bags and raw (just filtered) seed oil. There is also increasing demand for sunflower seed cake, a by-product of oil filtering process. Seed cake is used as animal feed; people keeping pigs in the area provide market for seed cake. Thus, farmers particularly those who don't sell raw seed but rather decide to mill their seed gain income from oil and the by-product, the seed cakes.

[7]Tanroads. Tanzania Road Distance chart in Km - March 2009.

Contract implication

Examining Table2.5, however, there appears to be little difference between contract and non-contracts farmers, first, in terms of land size allocated for sunflower production and the proportion of land allocated for sunflower production; and secondly in terms of the level of quantities produced.

Table 2.5: Selected relevant aspects of sunflower production

Relevant Variables in Mean Values	Non-Contract-Farmers .(n=195)	Contract Farmers .(n=205)	Difference	t-Test of difference
Acreage	3.3 acres	3.7acres	-0.4	-1.44*
Share of sunflower land to total h/land	.47	.49	-0.02	-1.06
Yield per acre	103.9kgs	121.5kgs	-17.7	-2.17**
Mean output	325.1kgs	422.2kgs	-97.1	-2.41**

***, ** and * represent significance at 1%, 5%, and 10% levels respectively
Source: Research data, 2012.

Contracts do not seem to have enough capacity to prompt farmers acquire large farms or release more land for sunflower crop from family land holdings. Table2.5 indicates that with a mean of 3.3 acres among non-contract farmers compared to a mean of 3.7 acres among contract farmers, the contracts practiced do not strongly encourage farm sizes expansion although the slight difference between contact and non-contract farms appears to be significant at 10% level.

This is probably because contracts practiced in the area do not attract differently (i.e. do not discriminate) between small and large farmers. This can be explained as follows; if contracting firms had differentiated types of payments, for example paying a higher price for those with bulk yields, such arrangement would prompt more farmers to expand their farms, and would attract large scale famers who have lower costs of production. The eventual outcome would be expanded acreages, leading to expanded overall production in the area.

From this situation, it can be inferred that contract farming system may not favour farm size expansion if they are not selective (i.e. discriminative) and motivating. It is argued in the literature that, contracts can create groups of losers in a way that can be relevant in assessing the success of a contract from a development perspective (Glover, 1990). If there had been contract menu, farmers would be attracted to different contracts depending on their characteristics.

Small acreage affects the overall volume of production. As can be seen in Table2.5, in overall, sunflower is still produced in small quantity at household despite use of contract farming. The total mean output of 422.2 Kgs for contract households is significantly higher than that of non-contract households at 325.1 Kgs as indicated in the table, but in general terms these indicate low returns as they represent a generally low level total output.

Productivity and quality of the produce

Related to the issue of acreage is the question of farm productivity. Contractual arrangements in which inputs are provided by agribusiness firms on credit or cash reduce the uncertainties associated with input availability, input qualities, and costs. Where input quality and adequacy of delivery are ensured, farmers benefit in terms of higher productivity and higher returns (FAO, 2005). Productivity (land productivity), at an average of 121.6 Kgs per acre among contract farmers against103.87 Kgs among non-contract farmers as indicated in Table2.5, is far below for example, the recorded 280 Kgs per acre obtained from one demonstration plot in Ihanda village mainly due to inadequacy of seed input delivered. Ihanda village is one of the villages covered by the contract scheme.

Although sunflower farmers require improved seeds and fertilizers and other inputs like manure for quality sunflower production, it is only seed that is provided to farmers through the present contract arrangements. Moreover, in some places farmers report to have received fewer amounts of certified seeds than what they actually needed. In certain areas only three kilograms of seed were distributed on

credit to farmers regardless of the farm sizes. Consequently, farmers were forced to use local seed varieties which are often poor; to supplement their seed needs (see Table2.6).

From Table2.6, it is shown that despite being in contract only 46.3% of contracted farmers managed to access sufficient quantity of seed needed. 53.7% of the contracted farmers could not secure sufficient quantity of quality seed through contracts. Contracting firms are not able to provide adequate amount of improved seed due to capital constraint.

Equally farmers are financially constrained, they cannot buy good seed from private retail shops due to high cost involved. A kilogram of improved seed costs Tshs 2500/-, and this is considered a too high price for many small scale farmers. Faced with such a situation, farmers choose to do seed mix, where improved and local seed varieties are used to satisfy their seed needs. Local varieties are cheap, sold at Tshs 500 per kilogram, and readily available in local markets or but can also be obtained from one's own previous harvest stock.

Table 2.6: Farm implements and inputs used in sunflower production

Type seed used	Contract farmers		Non-contract farmers	
	Frequency	Percent	Frequency	Percent
Improved seed variety	95	46.3	17	8.7
See mix(improved & local)	110	53.6	1	0.51
Local seed variety			177	90.7
Total	205	100	195	100
Farm implements used				
Hand hoe	30	14.6	31	15.9
Ox-plough	162	79.0	154	78.9
Tractor	13	6.3	10	5.1
Total	**205**	**100.0**	**195**	**100.00**

Source: Research data, 2012.

By delivering insufficient seeds to contract farmers, indicates how firms are not efficient, and this implies that the contract does not strongly contribute to

optimization of coordination of production plans to ensure right output is produced in right quantity. Contracts appear to be not strong enough to ensure coordinated production plans. With inadequate delivery of inputs, contracts are not able to induce farmers to provide their maximum efforts and are not able to induce optimal resource use (i.e. use of abundant other resources such as land and family labour available) in implementation of contracts. As a result productivity remains low and the quality of the produce is adversely affected.

When farmers were asked why they had joined contract farming, as indicated in Table 2.7, 79.51% of them mentioned the need for better yielding seed as major economic motivations for adoption of contract farming against 15.12% and 5.37% of them who mentioned market channel and farming services, respectively, as the major driving forces for their adoption of contracts.

Table 2.7: Reasons for joining contract farming

Reason why farmer joined Contract farming	Frequency	Percent	Cum.
Shortage of seed input	163	79.51	79.51
Shortage of market access	31	15.12	94.63
Shortage of credit services	11	5.37	100.00
TOTAL	205	100	

Source: Research data, 2012.

Seed is thus, the most important input required but which is not easily accessible. Sunflower production requires new seed stock each year, and most of the farmers have a desire to secure access to improved seed every year. Yet they cannot afford doing that due to several reasons, among them lack of credit assistance or credit guarantee and problematic availability of better yielding seed varieties.

Farmers remain confronted with the fundamental challenge. They understand that, using own seed from previous harvest results in low yields, at the same time they understand that on their own, they cannot afford buying better yielding seeds due high costs involved and given their limited financial ability. Contract arrangements pre-designed to resolve this problem of seed scarcity fail to be a viable option. It is

not only seed pledge that is not adequately fulfilled in the current contracts as expected, but also other important facilities like cash credit are not provided.

During focus group discussion[8] held at Iduo village, representative farmers who were from six villages unanimously raised the issues of poor credit services as another pressing problem. It was revealed that no contractor had provided cash credit and only 4% of all farmers reported had accessed credit services outside contractual arrangements. Few individuals who reported had accessed credit services named informal savings and credit schemes run by villagers themselves on self-help basis as the sources of credit, and the amount of loans extended to loan seekers was no more than a few thousand shillings, which are generally very small loans.

Lack of credit hinders farmers from accessing critical services like hiring of tractors or ox-ploughs, hiring of labour especially during labour intensive activity of weeding in a season, even supplementing short supplied seed. As indicated in Table2.6, over 15% of households in the sample still use crude technology in farming, whereby, a hand hoe is the major tool of land cultivation used. With limited working capital many farmers cannot hire tractors and credit service pledged by contractors that would enable them hire tractors do not come forth. Farmers, as a result, cannot start and finish in time their farm preparations due to their inability to hire better working tools. Often, they miss the first rains which are critical for smooth harvest in a climatic area that is known to have little and unreliable rainfall. Late planting leaves plants susceptible to pests' attacks. Low and unpredictable rains hinder` proper maturity of the crop, a situation that leads to poor performance of farms, and the subsequent low output.

[8]I held this discussion with six farmers from villages of Ijaka, Suguta,Ihanda, Chamkoloma, Iduo and Tubugwe Kibaoni at Iduo secondary school in in Iduo village in the afternoon off July 2nd 2013.

An issue with commitment to contract agreements

Enforceability of agreements by contracting parties is quite limited as evidenced by inadequate supply of seed input, the most important input promised in contractual agreement. One reason could be that there are more farmers willing to join contracts than what firms can adequately serve. This mismatch is a likely factor given the fact that the contracts designed are not restrictive in terms of the number of farmers each firm should recruit in its actual operations. There are equally no entry restrictions on the side of farmers. It is up to a company to decide how many farmers in a village should be involved in the programme. Often, supply of seed is not sufficient for all farmers, the firm becomes selective in its areas of operation, and some farmers end up receiving insufficient amount of seed.

But, it could also be that these contracting firms themselves, which are small and medium private enterprises, are capital constraint and thus, fail to meet expectations and obligations specified in contracts. In chapter five, it is revealed that most firms engaged in contract farming are small family enterprises which are often financially constrained. They lack needed investments and working capital and fail to effect deliveries specified in the contracts like seed provision.

Poor contract enforceability could as well be a result of general lack of trust between parties to the contract. During separate discussions with owners of the two firms involved in contracting farming in the study area, it was found to be the observation of both that, in present contractual set up some farmers are generally not trustworthy Farmers have in the past depicted dishonest behaviour by side-selling their produce to different buyers even though they had taken inputs promising to sell product to input supplying firms as per contractual agreement. Against this background, contract buyers in some cases have deliberately chosen to dishonour agreement by supplying insufficient inputs to some farmers as a way to minimize possible total loss in case of side selling events.

On the other hand, inquiry as to why farmers do not honour the contracts and do side selling, revealed that, farmers have little feeling that they own, and are equal partners in present contracts they sign. The explanation for this appears to be rooted in the way contracts are formulated. Farmers are not sufficiently involved in contract formulation process. Firms dominate the process. Village meetings held shortly before the farming season commences is the only time when farmers are involved in negation of terms of contracts. Even at this point a farmer is just asked to accept or reject the terms and conditions of contracts prescribed to him/her. Farmers are not involved in the important stage of contract design.

In addition, there are appears also to be lack of adequate transparency in contract design process. This is evident by the fact that, during the survey, none of the farmers could produce a written copy of the contract he/she signed when asked for it. No copy of written contract agreement document is left with a farmer after negotiations, except a sheet on which he signs to acknowledge receipt of input supply like seed or canvas. This can be interpreted as an expression of lack of transparency and honest in whole contract formulation process and can be a potential source of conflicts during determination of benefits.

Contracts signed therefore are largely one sided agreements, they are designed and submitted to farmers. Farmers are takers of the contracts. Farmers either accept them or leave them. In this situation farmers appear to be subordinate partners while firm owners appear to be senior and powerful partners who hold market power, and can therefore manipulate terms of contract in their favour, including choosing to distribute less amount of inputs to some farmers when they see it fit.

Farmers were initially organized in groups of 70 members. Groups intended to build farmers bargaining power, however, overtime most of these producer groups collapsed and only 12.3% of farmers in the sample reported belong to farmers group. Even the few remaining groups are very weak due to poor management. Most farmers remain in contracts as individual farmers and sign contracts on individual basis. Consequently, contract agreements reached are not collectively bargained well,

and enforceability remains susceptible to several problems including moral hazard problem. Strong farmers group as noted by Key and Runsten (1999) would not only achieve better negotiation but also improved implementation of contract obligations. If mutual insurance farmer groups are achieved both sides would benefit. "In mutual insurance group members are jointly liable to fulfil all contracts signed by the members of the group. Since members have privileged access to information about the other members (which the firm does not have), they can avoid adverse selection (the incorporation of risky members into the group) and moral hazard (where members refuse to pay when they are able to)" (*ibid* p.396).

Production risk

Existence of risk is costly (Bogetoft &Olesen, 2004; Key & Runsten, 1999;da Silva, 2005). Production of sunflower in Kongwa has both general and stochastic production risks. The general production risk is mainly associated with weather conditions especially drought. All farmers experience this risk, and this kind of risk is comparable among all farmers. Stochastic or idiosyncratic risk is associated with those risk factors which affect the individual sunflower farmer randomly such as transport losses, fire, and theft. Setting up of contracts between sunflower farmers and processors is influenced by these risks and contracts are meant to address these risks in order to promote high level of certainty in crop production.

Both farmers and contracting firms face risk of some degrees. In present contracts if the crop fails due to bad weather or anything, a farmer is not compensated in any way for his efforts and land; additionally, in situation of crop failure, a contract farmer still has to bear the burden of repaying inputs issued to him/her on credit at some future date. A farmer is not insured and cannot be compensated for the loss incurred while undertaking the farming business.

On the other hand, if the crop fails the processor is in some ways shielded against the total loss. Although he/she is not instantly paid back for the inputs (the seed) he/she supplied to a farmer on credit, a provision is made that he/she would be paid

in the subsequent good crop season. The farmer is required to pay back in the next season the quantity of seed worth the monetary value of the credit seed as it stood during delivery. In any case the value of one kilogram of seed given on credit to a farmer is worth several kilograms of sunflower paid back after harvest. For example, it costs Tshs 2500 to obtain one kg of seed sunflower on credit, but one kg of sunflower output after harvest is sold at only Tshs 500. Thus, there are 5 Kgs of produce given back as payment for 1 kg of seed taken on credit by a farmer. It is in this manner of exchange that firms are profitably compensated even though after time has elapsed while a loss on the side of farmers is a permanent one.

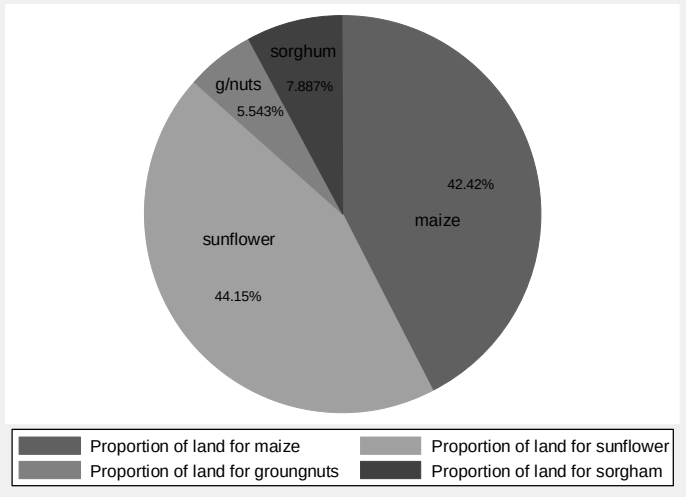
Management of Production risk

It is suggested in the principal agent model that, the principal who is less risk-averse, because of his ability to diversify his investment more than the agent can do, should take all risks except some part of stochastic risks which the farmer must bear for incentive purposes (Bogetoft & Olesen, 2004; Key & Runsten, 1999; da Sliva, 2005). However, in the case of sunflower production, contracting firms show that they are highly risk averse and farmer's production risk is not mitigated. A farmer is not insured, and for him, a crop failure means an obvious business disaster.

Contracting firms apart from carrying forward their claims, they minimize risk by diversifying their areas in which they carry out their business. It was revealed during discussion with contracting firms' agents that, Kongwa was not the only area the two contracting firms depended on for sunflower procurement. They had also business linkages with other sunflower farmers in other sunflower growing districts such as Iramba and Singida Rural Districts in Singida region.

Farmers on their side, attempt to minimize production risk by diversifying their land uses, allocating only a portion to sunflower production while the remaining land portion is used to grow important alternative crops such as maize, sorghum and groundnuts as indicated in fig 2.1.

Figure 2.1: Land allocation for alternative crops among contract farmers



Source: Research data, 2012.

Maize is the second most important crop grown in the area, which serves both, as food and cash earning crop. Like sunflower, it is a seasonal crop which is widely grown by majority farmers. It can be said that management of risk in the current contract farming arrangement does not maximize the integrated benefit as described in the overall contract objective pre-set. It is thus, doubtful if it can be viable and sustainable.

Risk sharing

Minimization of risk through risk sharing is an important aspect of standard contracts. In the case of sunflower contracts however, production risk is not fairly shared. It is argued in literature, Gibbons (2005), Bogetoft and Olesen (2004) that processors should be cautious, that, while they have a duty to ensure inputs are supplied to producers, they should guard against generating moral hazard behaviour among recipients of inputs. This means that farmers should as well be made to understand that, farming is their business, and it is they who have primary responsibility of developing and promoting it. They should therefore be encouraged to meet part of their input requirements on their own. It is said, this is a recommendable decision because it serves to bring balance in risk bearing between producers and buyers.

Findings on this indicate that, in situations where farmers are not able to obtain full amount of seed they need from contracting firms, they are not able to cover the deficiency with their own capital. As indicated in Table2.6, all farmers (53.6%) who received fewer kilograms of seed than they needed supplemented instead, with the local seed variety, which is cheap and easily available in local open markets or just from own previous harvest, but which is known to give low yields.

Therefore, the strategy where contracting firms provide minimum or limited support hoping to induce farmers adopt self-help sprit and hence supplementing input needs with their own funds, does not seem to achieve the intended objective of risk sharing. The way risk is addressed appears to be detrimental to total production level, and this subsequently affects the pace of development of sunflower business in the area. Farmers realising that they cannot afford all input requirements for efficient sunflower production have intensified little on the use of other factors like land in production of sunflower. The share of land under sunflower production to total household land is not statistically different from the share allocated for the same crop by non-contract farmers as noted in Table 2.5.Thus, Sunflower output cannot be optimized due to poor coordination around resource provision and distribution.

There is in current contract arrangements weak risk sharing which leads to sub-optimal production resulting from independent decisions of parties. Each party chooses to maximize own gain at the expense of the anticipated high integrated gains.

2.6.3 Motivation

Production of sunflower entails several decisions making on the side of producers. It is impossible to specify and monitor all farmers' actions. It is therefore important for contract to provide incentives so that farmers perform well on their side even in their hidden actions or in situations where they cannot be observed by the other partner, so that the common goal (the integrated gain) achieved in the end, is maximum. Farmers are assured at the beginning of the growing season of a market for the whole quantity of output they would produce. Pronounced market reassurance, although

with no specified pre-determined price (contract price), encourages farmers to provide high efforts in production of quality sunflower. Assured product market strengthens market reliability even though the promised price to be paid is just the market price. From the economic point of view of micro economics theory, price mechanism lead to efficient transactions, provided property rights are well defined (Coase, 1960).

However, within the current transactions, the quality of the produce, an important aspect of standard compliance, does not come out as an important issue. During product sales period, same price payments are made on delivery of produce at the collection points in the village regardless of the quality or grade based on seed type used. This, in a way, does not motivate farmers to use always quality seed and, this is the reason why some farmers choose to use seed from own previous harvests instead of buying new certified seed each year. There are no stipulated ways in the current contracts attaching procurement to quality of the produce or price offered to quality of the produce. There is no sort of price discrimination or differentiation to encourage standard compliance in production.

Furthermore, farmers have certain expectations about payment. Price information that is prepared and regularly disseminated to farmers by Kibaigwa market (the major national cereal market located in Kongwa district) serves as the base price. The price is regularly availed to farmers in villages by means of mobile phone short text messages, which is then printed on public notice boards in each village for farmers to note and use in their price negotiations and sales agreements. This Price serves as indicative price as well as buying/selling price. Therefore, without pre-determined price agreements, current contracts are less motivating. Commitment to contracts would be enhanced only if contracts were able to command premium price.

Price risk sharing

Under existing contracts, price risk is somehow fairly shared between the farmers and the processors because they both hold that the market price is an ideal price. But,

this kind of contractual agreement leaves a possibility of opportunistic behaviours between parties to the contract arising from the inherent conflict of interest between the farmers and the buyers. Farmers want a high price for their produce while buyers want a low price, which will enable them buy more quantity of the produce. Thus, if price in the spot market increases more quickly than usual, buyers may postpone to buy until a lower desired price is reached.

For example, when interviewed on how marketing was progressing during the survey, the representative of firm A[9], who is also a lead famer and resident in Tubugwe Kibaoni village disclosed that the firm had given notice that, it would not buy much from the village in that season (2012/13) because of high and the ever increasing price, which the managing director of the company cited as being unacceptable and prohibitive. This, however, does not represent a real threat to farmers in the current market situations because sunflower has many buyers who are readily available in villages when selling season is due. But this turn of events represents a precarious market situation, which implies that shirking can occur from any side of the current contracts. While buyers may refuse to top up the market price difference, the producers on their side may hold up contracting firms until a higher desired price is agreed or otherwise may eventually choose to side-sell and benefit from the prevailing higher price offered by other free competing buyers.

In general, hold-up problem appears to have more impact on contractual relationship than on economic positions of the individual contracting companies. Contract-farmers may hold-up, demanding improved price, but when this happens contract firms move to other districts to continue with open procurement of sunflower produce. This outcome nevertheless, is detrimental to continued contractual trade relationship. Firms become de-motivated in subsequent contractual agreements and remain unwilling to invest in contractual activities. Therefore, with current contractual arrangements, market uncertainty problem is somewhat fairly addressed

[9] Interview with Firm A representative (a lead farmer) was conducted on 24th September, 2012 at Tubugwe Kibaoni village office.

through price mechanism but remunerative price to farmers cannot be guaranteed, and this represents one of the major weaknesses of present contracts.

Moral hazard behaviour

Side-selling is the most pervasive problem as far as sunflower contract farming is concerned in the area of study. This problem constitutes an aspect of moral hazard behaviour, whereby some farmers undertake to side-sell their produce to different buyers with whom they had no previous marketing agreements. This occurs when market conditions change such that contract farmers see opportunity to make even more profits by selling to a buyer other than contract buyers. Only about 26.32% of contracted farmers reported fulfilled their obligation of selling produce to their respective contract buyers.

As a way to motivate farmers' efforts and commitment to contract agreements, contracting firms guarantee that they will purchase the product from farmers as scheduled. In additions, contractor promise to offer a price that is slightly higher than the prevailing open market price to demonstrate their good will and commitment to signed agreements. For example, at the beginning of selling season when the market price was Tshs 30,000 per bag of 70 Kgs, firm **A** was buying at Tshs 32,000 per bag. This effort still did not succeed in completely containing the problem of side-selling because, as the buyer kept the price slightly higher, his competitors came in with price offer of Tshs 35,000 per bag of 70Kgs that was even higher than what he offered. Consequently, firm A decided to stop buying from contract farmers, who in turn, freely continued sell to different buyers. This was a blow to firm A, which had spent part of its resources funding farmer by means of providing them with seeds. Side-selling appears to be a real issue that is failing the existing contract system. This behaviour, which indicates lack commitment, suggests presence of basic problems within the present contracts.

Contracts are in general, inadequate. They, for example, do not specify precisely how much quantity (the minimum quantity of produce) a farmer must deliver to the

contract buyer in a season at a market price, before he is allowed to sell to any other buyers. It is only loosely mentioned in one clause that, "a farmer should sell at least 50% of total produce." Therefore supply of produce to the contract firm relies largely on farmer's own loyalty. This may not work well because as revealed in discussion at the beginning of this section 2.6.3, contracts are not motivating enough to draw right bebaviour from the farmers in situation where alternative buyers are easily reachable. For example, a farmer who sells all his produce to his respective contracting firm is not treated differently from those who do not. He does not benefit more or exceptionally, e.g. given a bonus for being loyal. He keeps the contractual relations but with no significant additional benefits and contracts remain less attractive.

2.6.4 Transactions cost minimisation

In securing and implementing contracts, both farmers and firms seek to organize their businesses in such a way that costs of doing business are minimized. Transaction costs in contract farming include those costs incurred in contacting and establishing relationship with village leaders and farmers. This entails all efforts trying to win goodwill at the village community level, costs of gathering villagers for mobilization seminars where each participant is paid a token of Tshs 2000/, cost of writing and printing the contract and cost of monitoring contract where supervisors are provided with motor cycles to facilitate their movements to reach over 1200 farmers in eight villages covered by the programme, (each motorcycle costs over Tshs 2.5million)

There are several ways companies try to minimize their costs in contract production of sunflower. Firstly is through limiting the number of negotiation meetings. There is usually only one meeting held at the beginning of the farming season. The cost of this first meeting, intended for mobilization, motivation, and negotiations, is borne by the contracting firm. Each farmer participating is paid a token of Tshs 2000. Farmers participating in this meeting pay for it in terms of time they allocate for participation. There is no participation fee charged.

Secondly, there is limited monitoring process carried out during implementation of contracts. Company representatives, who are also farmers and residents in the same villages, carry out monitoring on behalf of the company. Monitoring is limited to making value judgement statements on such things like; general crop performance, and ripening of the crop and conditions of harvest. They are provided with motorcycles to facilitate their movements.

Thirdly, procurement of produce after harvest is done weekly at one collection point in each village. This minimizes costs associated with buying for firms and selling for farmers as predicted in the literature (Key & Runsten, 1999; Bogetoft & Olesen, 2004). Farmers are relieved of produce transportation costs, which otherwise would have to be incurred if they had to transport their produce to any distant market place.

However, the power of current contracts to minimize transactions costs while maximizing profits appears to be minimal. First, they are not selective, in the sense that they are the same for all farmers. There are no specific incentives to attract efforts of better farmers who often have lower production costs. As noted above, selling, for example, is not tied to volume or quality of produce. Thus, both weak or poor farmers and wealthy farmers are equally attracted, indicating lack of cost minimization strategies.

As for the farmers part, there is little chance of minimizing costs because inputs provided by contracting firms are given either on cash or on credit. In any case a farmer pays the actual price and the input price charged by the company is often at market rates. The cost turns higher in the event of crop failure, where a farmer is obliged to carry over the credit burden to the next crop season.

2.7 Conclusion

The main driving force behind participation in contract by most small scale sunflower farmers is the need to access inputs, in particular better yielding seeds. Contract buyers on their side engage in contracts to coordinate product production and delivery to ensure steady supply of materials that will lead to optimal utilization

of their processing capacity. Outside the contract arrangements supply of raw material for their processing firms is uncertain and costly. Both farmers and buyer perceive the fact that they can be better off by engaging in contract farming.

Taking a holistic approach entailing examination of issues focusing on aspects of coordination, motivation and cost minimization strategies employed, evidence in this study reveals that commitment of parties to contract farming of sunflower in Kongwa District is still problematic. There is weak contract enforcement on both sides of contracts. For example, as revealed in the analysis, among the expected buyer-supplied inputs, it is only seed that is delivered to farmers and even this is not supplied in adequate amounts. Generally there is inadequacy of delivery. This shows that present contract fail to meet the efficiency expectation associated with coordination, implying that coordination itself is not of satisfactory level.

Coordination is implemented through both market mechanisms and joint planning. While the tasks of both farmers and buyers in contract are collectively spelled out before commencement a farming season, there are no sufficient coordinated efforts in monitoring the implementation of contracts. This means that coordination accounts only for a small proportion of the overall contract performance. This tells that there may not be meaningful coordination in contract if coordination does not stretch to cover all important stages of production and marketing processes.

Current contracts are not binding due to limited involvement of a higher local government authority, the district council. As was observed during preliminary visit to the district Agricultural and Livestock Office(DALDO) in 2011 prior to undertaking of this study, there were no records or information on the prevalence of contract farming in the district, but only to find out later that two companies were running contract farming in the district without knowledge of the district authority.

The higher local authorities need to be incorporated in some ways, as active actor in the contract scheme. The VEO or chairmen of the villages who are usually involved have not the sufficient power or authority. The situation could be different if the

District Executive Officer and the personnel at the Department of Agriculture are involved as important actors in design and implementation of contracts. Involvement of the district council particularly, as the mediator of transactions and arbitrator between the contracts partners would drive goodwill (Prowse, 2012) from both partners of the contract and there would enhance increased trust and respect.

Assured product market by processors represents the main incentive meant to motivate farmers' participation in sunflower production. This affects positively the farmers 'decision to participate in contracts. However, the competitive nature of the sunflower market coupled with the basic characteristic of the crop that, it is not perishable in nature, makes the market declaration incentive less binding. As observed in the review of contracts study (Prowse, 2012), standard crops that have uniform quality and are not perishable such as sunflower are usually traded in spot markets since the transaction costs there would be low. Therefore as long as present contracts do not pronounce forward contract price with risk premium, it might remain difficult to make them successful and sustainable schemes.

Finally, and in relation to the previous points discussed, the findings in this chapter further suggest that contracts may operate successfully if there is in place a conducive institutional environment. In particular, this refers to the question of whether there is appropriate legal system. There is currently lack of clear agreement on how to hand defaults, for example issues on penalties and arbitrations are not well addressed. As a result there are uncertainties in contract terms especially on buying arrangements and price. In this situation, parties cannot have confidence in the contracts they are engaged in, hence, likely to remain less committed to implementation of the agreements and expansion of related investments.

Lack of a specific section on contracts related to contract farming business where private firm engage a big number of small farmers simultaneously make present contracts less court-enforceable. There are no known legal penalties for contract deviations that can be effected in manner and time that enhances continued cooperation between farmers and firms in contract farming relationship. Both parties

would benefit from high level of commitment to contract obligations embedded in well-functioning legal framework. As contractual trade relationships develop in agricultural sector in the country, there is need to establish binding legal guidelines for formulation and maintenance of contract farming business as a special branch of business that has particular relevance to agricultural transformation based on public-private partnership as underlined in *Kilimo kwanza* initiative(URT, 2009a).

CHAPTER THREE

EFFECTS OF CONTRACT FARMING ON TECHNICAL EFFICIENCY OF SUNFLOWER FARMERS IN KONGWA DISTRICT

3.1 Introduction

This chapter examines the effects of contract farming on technical efficiency of production of small-scale sunflower farmers in Kongwa district. Contract farming system is viewed in modern development discussions as a feasible form of institutional market organisation. It is capable of overcoming many of the production and marketing limitations facing small-scale farmers particularly those in developing countries like Tanzania which are increasingly pursuing market oriented economic policies.

Contract arrangement enhances timely availability of agricultural inputs and product market outlets. With that ability, it has the potential of becoming a tool for transforming small-scale subsistence farming which constitute the economic main stay of many poor smallholder farmers into commercial production. This chapter adds to the existing empirical literature on effects of contract farming on technical efficiency of smallholder farmers.

Additionally, it applies a relatively new statistical method of analysis, the propensity score matching method (PSM), which has conventionally been used in experimental medical studies. The method which is based on the conditional independence or confoundedness assumption, effectively address the problem of self-selection bias inherent in choice problems in observational studies like this one. Results obtained therefore are more consistent and reliable. Contract farming in Kongwa district involves small local family firms which provide contracts which are informal and tailor made with limited government involvement to smallholders growing sunflower.

3.2 Review of literature

3.2.1 Technical inefficiency in agricultural production

There is abundant literature on existence of technical inefficiencies and low returns in smallholder farming business widely found in rural parts of many developing countries. Some of the past studies that have dealt with this subject include that of Koopmans (1951), Farrell (1957), Schultz (1964), Timmer (1971), and Bravo-Ureta and Evenson (1994). It is argued in the literature that in small agricultural production, inefficiency is often associated with factors related to demographic characteristics of a household, farm characteristics and the structure of organisation and management for which farmers are accustomed to (Battese & Coelli, 1993; Forsund, Lovell, &Schmidt, 1980).

The literature points out also that incidence of failure in the markets for credit, insurance, information and product lead to agricultural production being carried out at low level of technical efficiency. Agricultural productivity is held low because farmers cannot optimally use even those other resources that they have in abundance like land and labour, (Key & Runsten, 1999). The gap between what is actually produced and the potential output level remains hugely wide and the income remains low. Therefore, improving technical efficiency of production is important. With improved efficiency farmers can increase their productivity, total output and incomes without requiring increase in inputs or change of technology or price.

3.2.2 Contract farming, economic efficiency and productivity

In theory farming contracts enable smallholder farmers to access better resources; i.e., better credits, inputs, information, services and product market from agribusiness. In effect, these help farmers achieve high levels of efficiency, productivity, and higher returns on their farming activity. Scarcity of resources is what makes improvement in efficiency and productivity important to farmers or any economic agent.

According to Grosh (1994), Glover (1994), Key and Runsten (1999) CF helps in organizing agriculture in such a way that market imperfections are dealt with. CF addresses all aspects of production and marketing limitations which hinder both smallholders and agribusiness firms from gainful participation in the spot markets in ways described as follows;

Commodity production: With regard to production of commodities, capital is required, therefore credits are most important resources required. But often credit markets in developing countries are undeveloped or completely missing. With contract system however, agribusiness firms solve the problem. Agribusiness firms come out as credit lenders, who can always reclaim their money by withholding repayments from production returns. Capital credit supplied in kind favour expansion of farms and related activities.

Production insurance: Similarly production of products requires insurance against certain risks e.g. those related to vagaries of nature like bad weather, and unforeseen risk like price falls in the product market etc. But in most developing countries insurance policies are not there to cover the smallholders along these risks due to high costs that may be involved. Under contract system, however, agribusiness fit in well in solving the problem by offering a forward contract with fixed price which include a risk premium. Firms therefore, help small holders manage their production and marketing threats.

*Information***:** Efficiency in production depends also on availability of appropriate knowledge and technology. Market for information systems are usually poorly developed in developing countries, as the result, smallholders find it difficult to access required information for their production activities. Through contracts, private agribusiness firms can solve this problem by stipulating within the contracts conditions under which necessary interactions between farmers and firm extension agents are established.

Input market: High value commodity production may also require specialized inputs like better yielding seed, but these are usually not available or are not easily accessible to many poor smallholder farmers in low economy countries. Through farming contracts however, agribusiness firms can provide smallholders with access to them. Input provision by firms reduces uncertainties associated with input availability, equality and costs. In the absence of contractual arrangements access to quality and adequate input would be unfeasible to many farmers. Ensured supply of quality and adequate input translate instead, into optimal allocation of resources that lead to high productivity and returns.

Product market: Undeveloped product market hinders farmers from bearing risk of producing a crop. Through contract farming, market is assured. Uncertainty and transaction costs associated with the search for market are reduced. Price variations are controlled or reduced and farmers are encouraged to engage in production of the contract crop and income stability is enhanced. Equally, undeveloped market hinders firms from accessing required volume and quality of product. Through contract farming, firms can ensure reliable delivery of a product in quantity and quality required.

With contract farming arrangements therefore, farmers are relieved of credit and market constraints and can thus optimally use the inputs. Non-price factors involved in the contracts, such as technical assistance, training and education, induce farmers to better use their inputs. Farmers are consequently able to attain high level of efficiency and hence be able to increase productivity and total production from given same input bundles with a given fixed technology (Ruben & Saenz, 2008); Chackraborty, 2009).With forward price which is a risk premium, farmers are eventually able to earn high and stable farm incomes.

3.2.3 Technical efficiency and its measurement

In economics the terms efficiency and productivity are widely used and many times interchangeably. Coelli, Christopher, and Battese (2005) argue that is not proper,

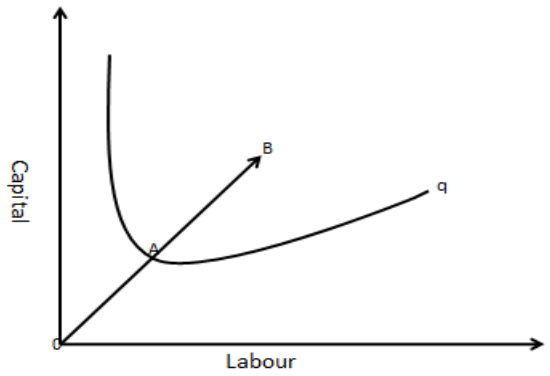
for, the two terms have important differences despite their similarities and linkages between them. Productivity is the measure of production function, and production function is the function that describes the maximum output of a product attainable from each level of input. Productivity is thus represented mathematically as a ratio of the amount of output produced to the amount of resources used; large values of this ratio are associated with better performance (Coelli et al., 2005). Efficiency on the other hand refers to both technical efficiency, (i.e. ability of a farmer to attain maximum output feasible from a given level of input) and allocate efficiency, (i.e., ability of the farmer to use inputs in optimal proportions, given input prices)

Technical Efficiency (TE) as presented in literature (Farrell, 1957; Coelli et al., 2005), is about the maximization of output for a given set of inputs. It compares the actual input combinations used to produce a unit of the output with an efficient, un observable but estimatable isoquant from a sample observations. Technical efficiency is measured by comparing the observed output in production function against the feasible (frontier) output under the assumption of fixed input; alternatively, it is measured as the ratio between the observed input and the minimum input under the assumption of fixed output in cost functions. TE indicates how far the firm can increase its output without employing additional resource but rather improving the level of its efficiency. It helps understanding of how farmers are operating and what factors are affecting their production. Thus, through non-price factors, contract farming may bring about a decrease in cost of production or increase in yield per unit, which in turn may enhance production efficiency, productivity and incomes of farmers involved.

From Farrell's presentation of technical efficiency, the firm's production technology is represented by the production function which defines the maximum attainable output level from different combinations of a given set of inputs. From Fig 3 if the firm produces output level q using the two inputs capital (K) and Labour (L) at point B, it is technically inefficient as compared to frontier firm operating at point A producing the same output q.

The technical efficiency of a firm relative to the efficient frontier or best practice firm is represented by the ratio OA/OB. The points on the frontier curve are efficient points while those above the frontier are inefficient.

Figure 3.1: Farrell's efficiency index



Source: Farrell, 1957

Hence, the measure of Technical Efficiency (TE) is based on the frontier production function, and TE is embodied in the failure of a producer to reach the maximum feasible bound of the firm's production frontier. It is a ratio of observed output to maximum feasible output in an environment characterized by conditional expectation of the symmetric error component. The value of TE ranges from 0 to 1 and indicates the degree of technical efficiency.

If it were possible to establish a frontier, it could be possible to measure the technical inefficiency of any firm (or farmer) by comparing the position of the firm relative to the frontier (the best practice). In practice however, only observations of the input levels employed and output levels achieved are available, as such, it is the two variables that must be used to estimate the production frontier.

3.2.4 Estimating technical efficiency

There are two approaches widely used in literature to estimate TE. The first one is an econometric method which employs stochastic frontier analysis models (SFA). All stochastic frontier models were introduced by Aigner and Chu (1968) and later on

extended by Aigner, Lovell, and Schmidt (1977), Meeusen and van de Broeck (1977) and Batteseand Coeli (1995). They are parametric models. The basic underlying assumption of the SFA models is that; deviation from the production frontier may not be entirely under the control of farmers. Thus the models allow accounting for effects of statistical noise and effects of the inefficiency factors. SFA also allows hypothesis testing on production structure and efficiency. SFA imposes on the other hand a distributional assumption on the inefficiency distribution and frontier technology.

The second approach is Data Envelopment Analysis (DEA), which uses non-parametric techniques. DEA does not impose any distributional assumptions but assumes the absence of statistical noise (i.e. absence of measurement or sampling errors). Deviation from production frontier is assumed to be under the control of a farmer. DEA is thus, deterministic and it does not suffer from functional form misspecification problem common in parametric approach.

This study uses stochastic models as proposed by Kumbhakar, Ghosh and McGuckin (1991) and extended by Battese and Coelli (1995). The advantage of econometric approach over the other approach is that, it allows accounting for the statistical noise and inefficiency. It provides estimators for the parameters of model linear in parameters with a disturbance term that is assumed to be a mixture of two components, which have a strictly nonnegative and symmetric distribution respectively (Kumbhakar & Lovell, 2000).It generates good results for a production set-up in which there is a single output and multiple inputs.

Nature of Stochastic Frontier Problem

If assumed that a farmer has production function $f(x_i, \beta)$in a world without error or inefficiency the i^{th}farmer would produce;

$y_i = f(x_i, \beta) - (i).$

Where

y_i Represents i^{th} farmer output, $f(x_i, \beta)$= the deterministic part of the production function in which x_i is a vector of x >0 inputs and β is a vector of parameters to be estimated.

Stochastic Frontier Analysis assumes that each farmer potentially produces less than what he/she might produce due to a degree of inefficiency (Aigner et al., 1977), thus in reality the equation specifically is

$$y_i = f(x_i, \beta)TE_i ----------(ii)$$

Where TE is the level of technical efficiency of farmer i; TE must be in the interval (0, 1) if $TE = 1$ the farmer is achieving the optimal output with the technology embodied in the production function $f(x_i, \beta)$

When$TE < 1$, the farmer is not making the most out of the inputs x_i with given technology embodied in the production function $f(x_i, \beta)$and because the output is assumed to be strictly positive, i.e. $y_i > 0$, the degree of TE is assumed to be strictly positive i.e. $TE > 0$.

Output is also assumed to be subject to random shocks (like weather, diseases, pests) implying that;

$$y_i = f(x_i, \beta)TE\ exp(v_i) ----------(iii)$$

Where v_i is the symmetric error component which is assumed to independent and identically distributed as N(0, σ_v^2); it accounts for the random variations in output due to factors outside the control of the farmer, such as weather conditions, pests, measurement errors etc.

And if both sides of (iii) are divided by $f(x_i, \beta)\ exp(v_i)$

$$TE = \frac{y_i}{f(x_i,\beta)\ exp(Vi)} ----------(iv)$$

The equation indicates that TE is a ratio of observed output to maximum feasible output in an environment characterized by conditional expectations of (v_i)

y_i is the observed output, $f(x_i, \beta)$ indicates the deterministic part that is common to all producers, while $exp(v_i)$ is a producer specific part, which captures the effect of random noise on each producer.

Taking the natural logarithms of both sides of (iv) gives

$$ln(y_i) = ln\{f(x_i, \beta)\} + ln(TE) + v_i ----------(v)$$

Notable, is the fact that inefficiency is subtracted in the production frontier instead of being added as in case of cost frontiers, this is because the production function represents maximum output whereas the cost function represents the minimum cost (Kubhakar & Lovell, 2000).

If inefficiency is specified as $u_i = -ln(TE)$ and if it is assumed there are k inputs, equation (v) yields

$$\ln(y_i) = \beta_0 + \sum_{j=1}^{k} \beta_j \ln(xji) + v_i\text{-}u_i \text{----------(vi)}$$

Since u_i is subtracted from $ln(y_i)$, restricting $u_i \geq 0$, it implies that $0 < TEi \leq 1$.

According to Battese and Coelli (1995), the inefficiency u_i follows a positive truncated normal distribution with constant scale σ_u^2 and location parameters μ_i that depends on additional explanatory variables. Technical inefficiency is defined as;

$$u_i \sim N^+(\mu_i, \sigma_u^2) + w_i; \text{ With } \mu_i = \boldsymbol{z_i}\alpha ----------(vii)$$

Where;

$\boldsymbol{z_i}$, is a vector of explanatory variables associated with the technical inefficiency effects?

$\boldsymbol{\alpha}$, is a vector of unknown parameters to be estimated.

$\boldsymbol{w_i}$, represent unobserved random variables which are assumed to be identically distributed. They are obtained by truncation of normal distribution with mean zero and unknown variance σ_u^2 such that u_i is non- negative.

β and α, in equations (vi) $and(vii)$ are unknown parameters to be estimated together with the variance parameters which are expressed in terms

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 ----------(viii)$$

Where;

$\sigma_v^2 =$ the variance parameter associated with the symmetric error component(v) which is assumed to be independently and identically distributed as $N(0, \sigma_v^2)$. It is an

error term which accounts for the random variations in output due to factors outside the control of a farmer such as weather, disease measurement error etc.

σ_u^2, is the variance parameter associated with one-sided error component u (the inefficiency of a farmer relative to the stochastic frontier) which assumes only positive values and has distribution assumed to be half normal being identically and independently distributed as $N^+(0, \sigma_u^2)$.

σ^2 , is thus, a composite variance parameter = $\sigma_v^2 + \sigma_u^2$

According to Battese and Coeli (1995), the variance ratio parameter γ (gamma) which relates the variability of μ_i to total variability σ^2 can be calculated as;

$$\gamma = \frac{\sigma_u^2}{\sigma_v^2+\sigma_u^2} \quad or \quad \gamma = \frac{\lambda^2}{(1+\lambda^2)} \quad ----------(ix)$$

So that 0≤γ≤1. The ratio of the standard deviation of inefficiency component to the standard deviation of the idiosyncratic component λ (lambda) is calculated as

$$\lambda = \frac{\sigma_u}{\sigma_v}$$

This means that if the value of γ equals zero, the difference between yields of a farmer is entirely due to statistical noise while on the other hand a value of 1 indicates that the difference in yields of is entirely due to technical inefficiency. Thus, the technical efficiency of a farmer is between 0 and 1 and is inversely related to the inefficiency effect and is predicted using predictor that is based on the conditional expectation of given the composite error $\varepsilon = (u_i + v_i)$and can be estimated using STATA version 11. The value of λ that is greater than one suggests presence of significant inefficiency.

3.2.5 Empirical literature on contracts, technical efficiency and productivity

The empirical literature on the role and effects of contract farming on technical efficiency of small scale farmers in developing countries is not conclusive. Some studies indicate that contracts succeed in improving productivity from efficiency gains achieved through contractual arrangements.

The study by Ramaswami et al. (2005), which investigated the efficiency factors in contract farming by Indian poultry producers, concludes that producers involved in contracts attain a higher efficiency level mainly due to a higher feed-conversion ratio. Similarly, the studies by Ruben and Saenz (2008), Chackraborty (2009) and Key and Runsten (1999) find positive relationship between contract farming and production efficiency. Other studies however, for example, the study by Bravo-Ureta and Pinheiro (1997) and Rao, Brummer and Quim(2012)have found weak connection between contract and technical efficiency.

As for contract and productivity relationship, there are many studies which indicate that CF improves productivity levels of the participants. Warning and Key (2002) examined CF of peanuts in Senegal and found that farmers who participated in contracts managed to access inputs such as; improved seed, fertilizer and extension services from the private agribusiness firm and as the result, they were able to increase productivity, Rao et al. (2012) conclude that participation in supermarket contracts leads to substantial productivity gains for Kenyan farmers of vegetable. Farmers benefit from having reliable access to inputs needed for their production. In sum, inputs provided by agribusiness firms in an adequate amount and quality reduce the uncertainties associated with input availability, quality and costs and translate into higher productivity and higher returns.

3.3 Empirical models

In order to effectively investigate the effects of contract farming on technical efficiency of sunflower production of small farmers involved in Kongwa district, the following econometric modelling were adopted.

3.3.1 Model for estimation of technical efficiency and its determinants

In analysing technical efficiency of sunflower production and its determinants, this study adopts Stochastic Frontier Analysis (SFA) model as developed by Kumbhakar *et al*. (1991) for cross section data and as slightly extended by Battese and Coelli (1995) for panel data. A Stochastic Frontier Production Function with composite

error term is estimated using a Cobb-Douglas formulation. In this study technical efficiency level was the key issue to be investigated. Cobb-Douglas formulation is in particular more powerful and useful linear model when a study investigation has a focus on efficiency measurement and identification of determinants of inefficiency (Taylor, Drummond, & Gomes, 1986). In addition, Cobb-Douglas production formulation helps in making study comparison, as several other studies have applied the technique in their analysis of smallholder farming efficiency in Tanzania, for example Msuya, Hisano, and Nariu(2008 and Ashimogo and Msuya (2005).

There are two approaches in the literature widely used in estimating Technical Efficiency (TE) using stochastic models. In the first approach a two-stage technique of analysis is used, where, in stage one, the technical inefficiency is predicted after the specification and estimation of the stochastic frontier production function. Then in the second stage the predicted inefficiency measures obtained in the first stage is regressed on some explanatory variables assumed to be associated with inefficiency such as household characteristics and other socio-economic variables, and usually the OLS method is used in stage two (Battese & Caelli, 1995).

Thus, in the first stage, inefficiency effects are assumed to be identically and independently distributed whereas in the second stage these error terms are assumed to depend on some other variables, this violates the distributional assumptions of the error terms made in step one. This violation is recognised in the literature as the major weakness of this approach (Battese & Caelli, 1995; Coelli et al., 1998). It is because of this that, the approach is considered somewhat to be inferior to other methods in particular the maximum likelihood approach (Kumbhakar *et al*., 1991; Coelli *et al*., 1998).

The second approach in estimating TE is as developed by Kumbhakar *et al*. (1991)for cross section data and as slightly extended by Battese and Coelli (1995) (for panel data). A stochastic frontier production function is estimated using a single-stage maximum likelihood model in which both production and inefficiency determinants are estimated simultaneously. This study adopted the second approach

on account of its strength, in the sense that it does not violet the underlying assumptions on error terms (Kumbhakar *et al*., 1991; Battese & Caelli, 1995). It is estimated using STATA software version 11.The analysis was conducted at household level.

The Cobb-Douglas production function in this study has the natural Logarithms of gross volume of sunflower output expressed in Kilogrammes as a dependent variable[10].

The frontier model fitted in this study was of the following type;

$$\begin{aligned} logYield = \beta_0 + \beta_1 \log(FSZ) + \beta_2 \log(LAB) + \beta_3 \log(IMPLEXP) \\ + \beta_4 \log(SEED) \mid + \alpha_1 AGE + \alpha_2 ADULT_{ratio} + \alpha_3 HHSZ + \alpha_4 EDU \\ + \alpha_5 EXPER + \alpha_6 NonAgr_{asset} + \alpha_7 LAND_{endow} + \alpha_8 SAV_{means} \\ + \alpha_9 Per\ CAPITA_{land}\ \alpha_{10 village2} + \alpha_{11 village3} + \alpha_{12 village4} \\ + \alpha_{13 village5} \alpha_{14 village6} + \alpha_{15 village7} + \alpha_{16 village8} + \varepsilon - - - -(x) \end{aligned}$$

Table 3.1 describes the variables used in the analysis of both production and inefficiency. The hypothesis is that, contract farming enhances technical efficiency of farmers through improved use of inputs supplied in contract such as seed, and farm services. Therefore more use of improved seeds and application of good farming practice increases efficiency.

[10]Farmers in the study area however, commonly measure their yields in terms of bags. A standard bag of sunflower harvest has 70 kilogrammes. Therefore sunflower yields of each farmer in this study were converted into kilogrammes and 1:70 was used as the conversion index.

Table 3.1: Variables in the production and inefficiency parties of SFA model

Variable Category	Variable Name	Parameter	Variable label and Measurement
Output	$logYield$ (Y)		Log-transformed total sunflower produced in Kilograms (Kgs) per season.
$\boldsymbol{X\_variables}$	(i) $logFSZ$	β_1	Log-transformed total Area Planted with Sunflower in Acres per season
	(ii) $logLAB$	β_2	Log-transformed total Labour(family and hired labour) in person days for farm preparation, hoeing/tilling, weeding and harvesting of sunflower.
	(iii) $logIMPLEXP$	β_3	Log-transformed oxen or Tractor Ploughphing expenditure in Tshs
	(iv) $logSEED$	β_4	Log-transformed amount of sunflower seed used per season in Kgs
$\boldsymbol{Z\_variables}$	(1) AGE	α_1	Age of household head in years
	(2) $ADULT_{ratio}$	α_2	Share of adults in the household members
	(3) $HHSZ$	α_3	Number of household members
	(4)EDU	α_4	1 for a given education level and 0 otherwise[11].
	(5)$EXPER_{SUNF}$	α_5	Years growing sunflower
	(6)$NON_{agricul}assets$(Tshs	α_6	Non-agriculture asset value (in Tshs)
	(7) Land endowment	α_7	Land endowment per household
	(8) SAV_{means} dummy	α_8	1 if certain type of savings, 0 otherwise
	(9) $Per\ CAPITA_{land}$	α_9	Land endowment per household members(acres)
	(10) $v2$ village dummy2	α_{10}	1 if yes, 0 otherwise
	(11) $v3$village dummy 3	α_{11}	1 if yes, 0 otherwise
	(12)$v4$ village dummy 4	α_{12}	1 if yes, 0 otherwise
	(13)$v5$ villagedummy 5	α_{13}	1 if yes, 0 otherwise
	(14)$v6$ villagedummy 6	α_{14}	1 if yes, 0 otherwise
	(15) $v7$village dummy 7	α_{15}	1 if yes, 0 otherwise
	(16) $v8$ village dummy 8	α_{16}	1 if yes, 0 otherwise

Source: Own construction, 2014.

[11]Household head's schooling is categorized into four categories: no formal education, primary schooling, and secondary schooling and with diploma or higher schooling.

3.3.2 Model for Contract Participation

In investigating factors responsible for individual household choosing or not choosing to participate in contract farming, a logit model is applied. The model estimates the probability of contract participation based on socio- economic characteristics of a household and farm characteristics. Results from logit estimation are used to measure the impact of contract on technical efficiency and productivity net of self-selection bias of farmers into contract farming. In logit model the observed outcome,y, is distinguishable from the underlying continuous

Unobservable (or latent) variable,y^*, that satisfies the single- index model

$y^*=x'\beta + \boldsymbol{u}$ ---------- (xi)

Where; $\boldsymbol{x}$ is a $K * 1$ regressor vector and β is a vector of unknown parameters.

Although y^* is not observed, y is observed.

$y = \begin{cases} 1 \; if \;\; y^* > 0 \\ 0 \; if \; y^* \; \leq 0 \end{cases}$ ---------- (xii)

Thus, in standard binary outcome model, the conditional probability has the form

$p_i \equiv \Pr(y_i = 1|\boldsymbol{x}) = F(x_i'\beta)$ ---------- (xiii)

Where $F(.)$ is a specified parametric function of $x_i'\beta$ usually, a cumulative distribution function (c.d.f) on $(-\infty, \infty)$ because, this ensures that the bounds $0 \leq p \leq 1$ are satisfied (Cameron & Trivedi, 2010)

The dependent variable in this study is, contract participation which takes the value of 1 if yes and 0 otherwise. The decision whether or not to embark on CF is a strategic business decision which must be modelled. Explanatory variables (X_i) are socio-economic characteristics of a household and farm characteristics which influence the selection process. These include; age, household size, household head education, experience of growing sunflower in years, household land endowment, land endowment per household member, value of non-agricultural assets in Tanzania shillings (Tshs), having a bank account, and a categorical variable of methods of saving(which takes a value of 1 if keeps himself, 0 otherwise; value 1 if

a household saves by means of a bank, 0 otherwise; a value of 1 if a household saves by stocking crop for resell, 0 otherwise;) and geographical location of a village in which a household lives.

To estimate the participation probability, a logit or probit model with maximum likelihood method is usually used but more often, a logit model with maximum likelihood method is preferred due to the consistency of parameter estimation associated with the assumption that error term in the equation has a logistic distribution (Ravallion, 2001; Xie & Manski, 1989).

However, in this study the sample is a response based sample[12], as such use of ordinary logit model would yield biased results resulting from possible over or under sampling of different groups (contract and non-contract groups) in the sample, depending on their responses. Therefore, this study applies weighted maximum likelihood estimation proposed by Manski and Lerman (1977) as adopted in Xie and Manski (1989).

Let, x_i be a vector of variables measuring the i^{th} farmer characteristics; where, $i \epsilon N$, and N is the sample size. The marginal distribution of x_i in the population is $p(x)$

Let, the discrete response for i^{th} farmer be, $c \in C$, where $C = 0, 1$ is the response set. The intention is to learn the probability$\Pr(c|x_i)$. It is assumed that $\Pr(c|x_i) = P(c|x_{i,}\theta^*)$ where P is a function known up to a vector $\theta^* \in \Theta$ and Θ is a parameter space of finite dimension K. The researcher's issue of concern is to estimate θ^* from the sample.

Let, $\frac{N_c}{N}$ be sample distribution over the response set C in each village

Let, Q be the distribution of C in the population

[12] The combined sample obtained through sampling process that stratifies on the response.

$Q(c)$ $(C = 0,1)$, is the true marginal distribution of the response known in each village (information on this is obtained from the contracting company's agents and village records from the village executive office (VEO) in each village in the survey area)

The weighted maximum likelihood logit estimator maximizes

$logL = \sum_{i=1}^{N} w(c_i) logP(c_i | x_i, \theta)$---------- (xiv)

Where $logL =$ the log likelihood of an observation

$w(c_i)$= the sampling weight= $Q(c)/(\frac{N_c}{N})$. $P(c_i|x_i, \theta$ = probability of individual farmer participating in contract conditional on (x_i), a vector of variable measuring the i^{th} individual farmer's characteristics, and dependent on θ parameters to be estimated.

Since $Q(c)$ is known from the knowledge on C distribution obtained from company and village records in the survey area and $\frac{N_c}{N}$ is known from field data collection from each village, the weighted maximum likelihood logit estimator is implemented using *STATA* software, any other computer software with maximum likelihood routine which allows weighting could as well be used (Xie and Manski,1989).

3.3.3 A model for estimation of contract effect on technical efficiency

In evaluation of programme intervention, it is important that the effect of the programme is measured quantitatively with least possible bias so that the true effect of the programme is determined. The standard framework of analysis is the potential output approach or Roy-Rubin Model (Roy, 1951; Rubin, 1974) as cited in Caliendo and Kopeinig (2008). According to this model conclusion about the impact of a given treatment on outcome of interest for the individual beneficiary involves estimation of how the individual would have performed had he not received the treatment (the missing counterfactual). According to this model, three main pillars constitute the model; these are individual beneficiaries, treatment, and potential outcome.

In this study the average treatment effects on the treated (ATT) is estimated. The frame of analysis consists of *treatment* which in this study refers to participation into contract farming; the *treated* are individual household participating in contract farming, while the *effect* of interest is the change; increase or decrease of technical efficiency of production(of sunflower), and increase or decrease of productivity of farmers participating in contract farming .

Let C, be a Dummy variable such that $C = 1$ if a household participates in contract farming and $C = 0$ if otherwise. And let Y_{1i} and Y_{0i} denote potential outcome (technical efficiency or productivity) of contract and non-contract farming households respectively.

The observed outcome of individual household is;
$Y = CY_{1i} + (C = 1)Y_{0i}$, rather than, $Y_{1i} - Y_{0i}$, for the same individual household. Thus, the primary treatment effect of interest to be estimated is the average treatment effect on the treated that can be written as

$$\tau = E(y_{1i} - y_{0i}|C = 1)$$
$$= E(y_{1i}|C = 1) - E(y_{0i}|C = 1) - - - - - - - - - - - - (1)$$

The problem however is that the counterfactual outcome of a treated household $E(y_{0i}|C = 1)$ in (1) is unobservable because a household can only participate or not participate in contract farming at a point in time. This is underlined in the evaluation literature as a fundamental problem of evaluation (Holland, 1986). This is because attempting to substitute the expected outcome of the treated household were they not treated (the $E(y_{0i}|C = 1)$, with the expected outcome of the households that were certainly not treated (the$E(y_{0i}|C = 0)$, would give biased estimates because, it is very unlikely that$E(y_{0i}|C = 1) = E(y_{0i}|C = 0)$. Since in observational studies assignment of subjects to the treatment and control group is not random, the estimation of the effect of treatment may be biased by existence of confounding factors.

Propensity Score Matching

Rosenbaum and Rubin (1983) proposed propensity score matching method (PSM) as method to reduce the selectivity bias in the estimation of treatment effects with observational datasets. [1]Propensity score matching method proposed by Rosenbaum and Rubin (1983) is a non-parametric method useful in matching program participants (contract farmers) with non-participants (non-contract farmers) using *the propensity score*

The propensity score $p(X)$ is defined by Rosenbaum and Rubin (1983) as the probability of receiving a treatment or not conditional on given pre-treatment characteristics:

$p(X) \equiv \Pr(C = 1|X) = E(C|X)$ Where $C \epsilon \{0,1\}$, and is the indicator of participating or not in program (contract farming) and X is a vector of multidimensional pre-treatment characteristics. Propensity score matching is a way to correct the estimation of treatment effects controlling for the existence of the confounding factors, based on the idea that the bias is reduced when the comparison of outcome is performed using treated and control groups who are as similar as possible (Rosenbaum & Rubin 1983). [That is for example, respondents being in the same area, responding to the same questions (questionnaire)].

Propensity score matching method therefore, involves construction of a statistical comparison group of participants and non-participants based on propensity score of participation in contract $p(X)$ where all observable characteristics have to be the same between participants (treatment) and non- participants (control) groups. The propensity score replaces the collection of X characteristics in the observational study with just one number based on these characteristics. Rosenbaum and Rubin (1983) indicate then that, X in equation (1) can be substituted for $p(X)$ so that;

$\tau = E[\{y_{1i} - y_{0i}|C = 1\} = E[E\{y_{1i} - y_{0i}|C = 1, p(X)\}]$

$= E[E\{y_{1i}|C = 1, p(X)\} - E\{y_{0i}|C = 0, p(X)\}|C = 1] - - - - - - - - - - (2)$

Rosenbaum and Rubin (1983) show that if the exposure to treatment is random within cells defined by X, it is also random within cells defined by the values of the one-dimensional variable, the propensity score p(X). It thus, becomes easier to condition on just one number (the single variable index, the probability of participation) than on a vector of characteristics. Propensity score reduces the dimensionality problem of matching treated and control units on the basis of the multidimensional vector of X. Effective and efficient matching becomes more feasible.

According to Rosenbaum and Rubin (1983), however, certain assumptions need to hold. First is the balancing assumption (balancing hypothesis). It is assumed that there should be balancing of pre-treatment variables given the propensity score. That is; X⊥C|$p(X)$, implying that observations (treated and control) with the same propensity score must have the same distribution of characteristics independently of treatment status. Secondly, the assignment to treatment is unconfounded given the propensity score. That is, conditional on X; C and (Y_{1i} , Y_{0i}) are independent; by notation Y_{1i} , Y_{0i} ⊥ C|$p(X)$, which implies that, to be observed should be all pre-determined variables simultaneously influencing participation and outcome.

If the balancing hypothesis is satisfied, observation with the same propensity score must have the same distribution of observable and unobservable characteristics independently of treatment status. Thus, for a given propensity score exposure to treatment is random and therefore treated and control units should be on average observationally identical (Backer & Ichino, 2002).

Common support condition

For quality matching of propensity score, proposition is further made that $0< p(X) < 1$ to ensure common support, that is, there are treated and non-treated for each characteristic in X for which comparison is made. If the common support is not satisfied in the treatment group e.g. if $p(X) = 1$ such households are dropped and ATT is estimated only for those households where; $p(X) < 1$. This restriction means

that the test of balancing property is performed only on the observations whose propensity score belongs to the intersection of the support of the propensity score of treated and controls (Backer & Ichino, 2002).

Procedures of estimating propensity score.

Generation of propensity score involves estimation of a probit or logit model, where the dependent variable is a dummy variable taking the value of 1 if a household is treated(participates) and 0, otherwise. Predictor variables are those factors which influence the likelihood of participation into contracts as well as outcome of interest (technical efficiency and income) but which are pre-determined. In binary outcome model, the conditional probability has the form;

$\Pr(C = 1|X) = F\{\beta(X_i)\}$ ----------(3)

Where $F(.)$ Is the normal or the logistic cumulative distribution, a specified parametric function and $\beta(X_i)$ is a function of covariates with linear terms.

Backer and Ichino (2002) developed STATA program which estimates propensity score and tests the balancing hypothesis in steps of the algorithm which are outlined as follows;

1. Fit the logit or probit model:
2. Split the sample into *k* equally spaced intervals of the propensity score, where k is determined by the use and the default is 5
3. Within each interval test that the average propensity score of treated and control units does not differ.
4. If the test fails in one interval split the interval in half and test again
5. Continue until in all intervals the average propensity score of treated and control units does not differ.
6. Within each interval test that the means of each characteristics does not doffer between treated and control units. A condition necessary for the balancing hypothesis
7. Finally impose the common support conditions to improve the quality of the

matches used to estimate ATT (Backer & Ichino, 2002).

Matching estimators of the ATT based on the propensity score using different matching algorithms

An estimate of the propensity score as given in equation (2) is not enough to estimate ATT of the variable of interest. This is because probability of observing two units with exactly the same propensity score value is implausible because propensity score is a continuous variable (Backer & Ichino, 2002). Several methods have been proposed in literature to overcome this problem.

This study uses the most widely used methods, the nearest neighbour matching (NNM) where each treatment unit is matched to the comparison control unit with closest propensity score. However, in order to check the robustness of the result of NNM, the effect of contract on technical efficiency and income using NNM method is compared to estimates using Kernel-based matching method (KBM).

*The nearest neighbour matching (NNM***)**

In this method each treatment unit is matched to the comparison control unit with closest propensity score. Once each treated unit is matched with a control unit, the difference between the outcome of the treated units and the outcome of the matched control units is calculated. The ATT is then generated by averaging these differences and is given as

$$ATT = \frac{1}{N_1}\sum_{i=1}^{N_1}(Y_{1i} - \sum_{j=1}^{N_0} wijY_{0j}) - (4)$$

Where

$N_1 =$ Number of participants

$N_{0=}$ Number of non- participants

$i =$ Index of participants

$j =$ Index of non- participants

$wij =$ Weights: where $wij\epsilon[0,1]\ and \sum_{j=1}^{N_0} wji = 1$

Y_{1i}, Y_{0j} , Outcome of interest on both participants and non-participants. With NNM all treated units find a match (Backer & Ichino, 2002)

Kernel-based matching (KBM)

This is another technique which uses a weighted average of the outcome variable for all individuals in the control (non-contract farmers) group to construct a counterfactual outcome (Backer & Ichino, 2002). Observations that provide better matches are given more weight. The weighted average is compared to outcome for the contract farmers (treated group) and the difference provides estimates for treatment effect for the treated case. A sample average over all treated farmers, provide an estimate of ATT given as

$$ATT = \frac{1}{N_1}\sum_{i=1}^{N_1} Y_{1i} - \frac{\sum_{j=1}^{N_0} Y_{0j} G(\frac{p_{j-} p_i}{hn}}{\sum_{k=1}^{N_0} G(\frac{p_k - p_i}{hn}} - (5)$$

Where G (.), is a kernel function and hn is a bandwidth parameter. $|p_{j-} p_i|$ is the difference in estimated propensity scores. The more similar participant i and non-participant j are, the higher the weights (Backer & Ichino, 2002).

Propensity score method in economics

The use of PSM in economic is relatively new. It used to be a popular method in medical studies and sociology. Of recent, however, it has been found to an invaluable method in economics studies in particular in cross-section studies (Dehejia & Wahba, 2002; Caliendo & Kopeining, 2008). Using propensity score matching method enables a researcher to match participants from the treatment group with participants from the control group so that the treatment group and non- treatment group can balance. A pair of household matched is identical to each other except that one is treated and the other is not. This method thus, reduces observed heterogeneity between treated and control groups and impact of treatment generated is free from idiosyncratic factors. Once units are matched the unmatched comparison units are disregarded.

Advantages of PSM

It is a superior method over other methods like ordinary least square regression and difference in difference. In making causal inference about average effects of the treatment on the treated, it identifies balancing units to ensure that there are both treated and non-treated units for each characteristic for which comparison is made. It uses joint distribution of the utilized regress or (Rubin & Thomas, 1996). It can significantly reduce bias in observation studies (Rosenbaum, 1987) because it reduces the number of dimensions on which to match participants and comparison units by using only a propensity score. It does not rely on any particular functional form e.g. linearity for relationship between the outcome and the features within each treatment and control group.

Disadvantages

With this method only the observable characteristics can be controlled, but not the unobservable ones. It needs reasonably a large data set showing detailed information on relevant observable characteristics depicting the selection process and potential influence to the outcome (Rubin & Thomas, 1996).

3.3.4 Dataset and variables

The analysis proceeds based on 400 observations and a short description of the important variables included in propensity score matching approach is in order here.

Outcome variables

Technical efficiency:

Contract farming has the potential of impacting productivity of farmers through improved technical efficiency. Analysis of technical efficiency helps to determine whether the current or existing technology used should be continued by improving the efficiency of the less efficient farmers or should be changed to improve level of productivity. Technical efficiency of small sunflower producers is estimated by using

a stochastic frontier model, equation(vi). Actual technical efficiency scores are generated by equation(iv). The average treatment effect of contract farming on technical efficiency of the treated (ATT) is estimated using different matching algorithms as given in equation (4) and (5).

Land Productivity

Productivity is the measure of production function, and production function is the function that describes the maximum output of a product attainable from each level of input. The focus in the analysis is also on the effect of contract farming Land productivity. Land productivity is represented mathematically as a ratio of the amount of output produced to the amount of land planted with sunflower.

Independent variables

According to propensity score matching method, the logit model (weighted) through which the propensity score is generated include explanatory variables that influence the choice of participation into contract and the outcome of interest(in this study technical efficiency, productivity and income). Predictor variables are as follows;

Age; a household head age captures aspects of physical fitness. Physical fitness influences a choice to participate in contracts. A farmer deciding to participate in contract may have to consider his or her age. Thus, it makes sense to include this variable in the self- selection model. Age also signifies one's life experience, while a younger farmer may be attracted to the mew programme like contract farming for the sake of trying adventuring in life, an old fellow may be tempted to join new programme to seek solution for the problems or limitations he is aware of. A farmer with advanced age may feel less mobile and less likely to make a living outside his village. Contract farming initiative in his village may be more attractive.

Household size and adult ratio: Sunflower production is generally laborious especially during weeding stage. Because of this laborious nature, a household with large number of economically active members is likely to choose contract farming

because at least in theory, has an advantage of having more labour available for farm works. A household with more dependants than adults may not be in favour of contract farming project for may not be sure of meeting labour requirement as per terms of contract. Inclusion of this variable is equally reasonable.

Household land endowment: this is a total land owned by a house hold. Land endowment is assumed to have important role in determining the probability of a household to participate in contract and expected production efficiency. Land size captures economies of scale; bigger land suggests higher value of production. A household with large farmland is likely to participate in contracts. But even more likely to participate in contract farming is a household with large land endowment per household member, in that situation both cash needs and household food security can be effectively taken care of. Thus, land endowment per household member may also be individually useful and inclusion of it is meaningful.

Education is a key for realization of economic opportunities (Norberg, 2001). Knowledge and awareness concerning opportunities associated with contract production is likely to influence probability of contract participation. Inclusion of it is meaningful.

Experience: More years of growing sunflower would induce a farmer to participate in contracts and affect positively production efficiency and income. Experience is assumed to be a proxy of accumulated useful knowledge and skills over time. A famer/household with long crop husbandry experience is likely to move fast into contract arrangement as he is able to identify problem solving elements within the contract arrangements. He may be in favour of the project in order to solve production and marketing limitations he well knows.

Households who can save by *means of durable assets* including seasonal cereal crop stocks like maize and sorghum are hypothesised to be wealthy and can participate in contract, as they can use their assets when re-sold to finance and improve their

farming activities or can just exchange their assets for other needed farming resources like labour.

Non-agricultural assets are considered to be proxy for wealth of a household and would have positive impact on contract participation, and also on production efficiency and income. Non-agricultural assets may generate fund or revenues or facilitate accessibility to resources including cash fund that can assist in financing farming and marketing activities.

Location of a village is also important in determining participation choice and efficiency. It is hypothesised that households in villages close to the main road that enters the villages via Kibaigwa national cereal market centre from Dodoma town where contracting firms are based are likely to experience easier access to information regarding contracting firms and their out-reach programmes in their areas. The main road reaching the study area from other important economic and commercial centres like Dodoma urban centre goes through five villages of Masinyeti, the entry village, then straight through Iduo, Suguta, Chamkoloma down to Tubugwe Kibaoni in the south. Three villages are geographically relatively far away from this important main route, these are; Ijaka, Laikala and Ihanda. Regional dummies serve as well to capture possible differences in general physical and environmental conditions, e.g. soil fertility and weather conditions.

3.4 Results of the study

3.4.1 Descriptive statistics

Table 3.2 compares selected variables between contract and non-contract farmers. 79.3% of all households surveyed were headed by males while only 20.7% were female headed. The predominance of males as household does not mean women have no say on household farming of sunflower, in actual fact decisions on resource allocation (land and labour) necessitate collective husband-wife decisions. Husbands like wives are regularly involved in all farm activities. The average age for non-

contract farmers at 41.4years is significantly lower than contract farmers at 43.7years.

Contract farming seems to be more attractive to elderly farmers; their advanced age implies experience and cumulative knowledge of the area in terms of physical and climatic conditions. And as explained in section 3.7, elderly farmers may choose to join new programme to seek solutions for the problems or limitations they are aware of. An elderly farmer in a village may feel less mobile and less likely to make a living outside his village, therefore, joining contract farming programme initiated in his/her own village may be a more plausible decision to make.

There are no significant differences in household size between contract and non-contract farmers, the average household size of among contract farmers is 5.3 while the average household size for non-contract farmers is 5.4. The average household size for the whole sample is 5.4 persons. However, the proportion of dependants in a household seems to be important in making decision regarding joining contract farming. On average the proportion of dependants is significantly higher among non-contract farmers at 0.5 than in contract farmers at 0.47, suggesting that labour matters in contract choice. Households with more dependants are less likely to be in contract farming programme.

There are no significant differences in level of education between the two groups. In overall, the majority farmers (74%) have primary level education, while 23.3% have virtually no formal education. Only 2.3% and 0.5% have secondary and diploma education levels respectively. Generally the level of education among sunflower farmers is basically a primary education considered to be a low education. Low education may work against the needed flexibility in attitudes towards adopting new farming practices.

Comparatively as indicated in the Table 3.2.Contract farmers are on average not significantly different from non-contract farmers in terms of farm size and share of land allocated for sunflower production, which suggests that there is no pronounced

concentration in sunflower production even among contract farmers. Yet contract farmers have significantly higher mean output and mean yield per acre. While contract farmers have mean output of 4223Kgs and mean yield per acre of 121.6Kgs, mean output, and mean yield per acre among non-contract farmers are only 325.1 Kgs and 103.9Kgs respectively, indicating that being in contract gives some advantages that enable farmers to produce more output per acre and more total output. Contract farmers have better access to high yielding seed variety and have higher rate of use of these improved seed at 46.3% compared to non-contract farmers' seed use at 8.7%.

In addition, contract farmers have significantly higher sales revenue, total non-farm income, and household income per capita compared to non-contract farmers, this also suggesting that farmers gain some advantages for being in contract which enable them to improve their production and productivity levels and income.

It is notable however, that contract farmers do not benefit differently from contract market, and only 26.32% of all contract farmers sold their produce to their respective contractors. Better access to extension services notable among contract farmers at 39.5% compared to 13.9% among non-contract farmers, coupled with relatively higher access to improved seeds at 46.3% and 8.7% between contract and non-contract farmers seem to explain the recorded improvement in production. Contract farmers who are shown to be relatively older than non-contract farmers as indicated in Table3.3 are found to be more technically efficient. The mean technical efficiency for contract farmers is 68% while that of non-contract farmers is 64%, and the difference is statistically significant at 5% level of significance.

Using simple t-test results assessment was also made to see if there had been indication of self-selection bias observable among contract farmers, the idea was to speculate whether the observable gains among contract farmers are results of participating in contracts or are there just because these farmers had better conditions even before joining contracts (self-selection bias), and hence would emerge far better off than their fellow non-contract farmers even if they had not engaged themselves in

contracts. This is just a preliminary investigation as the chapter eventually carries out rigorous estimations of the effect of contracts on variable of interests namely; technical efficiency and productivity using a method of propensity score matching.

Thus, ownership of assets which are not likely to change due to contracts (pre-determined assets) is considered. Table 3.3 shows t-test results of the mean differences between contract and non-contract farmers. Results show that contract farming households are not significantly different from non-contract farming household in terms of household land endowment, non-agriculture assets possessed and amount of labour power owned in households (given as proportion of adults in a household).

Therefore, although there are significant differences in sales revenue, non-farm income, and per capita household income, it is not suggestive that the initial conditions of contract farmers are much better than conditions of non-contract farmers. Based on these t-test results in Table3.2, it can be concluded that no strong evidence to show that there was self-selection bias among contract farmers. In other words, observable differences between contract and non-contract farmers in terms of productivity, sales revenue, total non-farm income, and household income per capita could be preliminarily, attributed to contract participation.

Table 3.2: Summary statistics of socio-economic characteristics of farmers

Variables		T/Sample *Means (N=400)*	Non-Contract-Farmers(*Means)* (N=195)	Contract Farmers(*Means*) (N=205)	t-Test of Means difference
Household	Age	42.55	41.36	43.67	-1.81**
	H/h size	5.38	5.44	5.33	0.50
	Adults-ratio	.49	.48	.506	-0.90
	Dependence ratio	0.49	0.51	0.47	1.71**
Farm	Farm size	3.60	3.40	3.70	-.29
	Farm –ratio	.48	.47	.49	-1.07
	Land-endow	8.42	8.28	8.55	-0.36
	Family Labour	23.07	22.80	23.32	-0.30
	Expenditure	50337.6	48143.75	52424.53	-0.71
	Seed (*in Kgs*)	11.52	11.77	11.29	0.41
	Output(*inKgs*)	374.9	325.13	422.25	-2.4**
	Yield (kg/acre)	112.9	103.87	121.55	-2.17**
	Tech_eff level	.65	.64	.68	- 2.57**
Income/revenue	Sales (*Tshs*)	164281	142282.1	185207.3	-2.37**
	farm income	242682.	213912.9	270049.4	-1.37*
	non-farm inc	14306.3	15202.6	13453.8	0.52
	T/ income	256989.	229115.5	283503.2	-1.32*
	H/h per capita	52513.5	42572.5	61969.66	-2.50**
	Agr- asset*Tsh*	670820	645041	695341.5	-0.64
	Non-agr(*Tshs*)	691022	808333.5	579434.3	0.52
		Percent	Percent	Percent	
Credit access	Accs credit %	4	4.1	3.9	
Extension	Ext- service %	27	13.85	39.51	
Education	No education	23.25	25.13	21.46	
	Pr. Education	74.0	73.33	74.63	
	Sec. education	2.25	1.03	3.41	
	Diploma	0.5	0.50	0.49	
Market access	Sold to contractor	26.32	24.52	27.98	
	Sold to other buyers	73.68	75.48	72.02	
Gender	Male	79.25	75.9	82.40	
	Female	20.75	24.10	17.56	

*, **and*** represent significance at10%, 5% and 1% levels respective.

Source: Research data, 2012.

3.4.2 Sunflower production efficiency level and its determinants

Before determining the effects of contracts on production technical efficiency and productivity of farmers, this section undertakes first to detect the presence of inefficiency in the production input-output data for the sampled households. This would justify functional form chosen, the stochastic frontier analysis (SFA) and the inefficiency approach adopted.

A stochastic frontier production is estimated and likelihood- ratio test is conducted assuming the null hypothesis of no technical inefficiency in the model for the sampled farmers, i.e. there is no technical inefficiency (H_0: $Sigma\_u = 0$) against the alternative hypothesis $H_{1:}$: $Sigma\_u > 0$). The test statistics are computed automatically and results reported at the bottom of the output when the frontier model is estimated by STATA statistical software (StataCorpLP, 2009). This section then proceeds to determine factors influencing technical inefficiency of sunflower production. The parameters of both the stochastic frontier and the inefficiency effects model are estimated by maximum likelihood (ML) procedure, following Kumbhakar *et al*. (1991), Battese and Coelli (1995). Technical efficiency level is computed based on equation(iv). The technical efficiency scores are predicted following the model estimation, and a comparison of mean technical efficiency between contract and non-contract farms is made using t-test.

As can be seen in Table 3.3, the inefficiency component of the disturbance term (u) is significantly different from zero; Likelihood-ratio test of sigma_u =0; is 23.34 with a p-value < 0.001. Thus, the null hypothesis of no technical inefficiency (H_0: $Sigma\_u = 0$) is rejected at 0.001 percent level using Z-statistics. This suggests that there is a statistically significant inefficiency effects in the production model. The value of lambda (λ) is greater than one confirming further that there persists inefficiency in farmers input-output production function and that technical inefficiency effects are indeed stochastic.

Table 3.3: Maximum likelihood estimates of parameters of the stochastic production frontier function of sunflower production

***Dependent Variable*: Ln aggregate sunflower Yield in Kgs**	**Coefficient**	**Std Error**
Independent variables;		
lnFarm size planted with sunflower(in acres)	.49***	.11
ln Labour input(in person days)	.25***	.09
ln Ploughing expenditure(farm implements expenditure in Tshs)	.05***	.01
ln seed input(in Kgs)	.15 *	.07
Constant	4.3***	.27
Number of observations	400	
Wald chi2(4)	298.23	
Prob > chi2	0.0000	
Log likelihood	-447.13	
Gamma (γ)	.82	
Lambda (λ)	2.12	
Likelihood-ratio test(LR) of sigma_u=0: chibar2(01) Prob>=chibar2	23.34	
	0.000	

*, **and*** represent significance at10%, 5% and 1% levels respectively

Source: Research data, 2012.

test _b[lnImPlexp] + _b[lnFSZ_1]+_b[lnSEED]+_b[lnLAB] = 1

(1) [lnyield2]lnImPlexp + [lnyield2]lnFSZ_1 + [lnyield2]lnSEED+ [lnyield2]lnLAB = 1 chi2(1) = 1.08 Prob > chi2 = 0.2985

This means inefficiency is an important issue explaining variations in output among small scale sunflowers producers in Kongwa district. Based on λ gamma γ can be computed which measures the effect of technical inefficiency in the variations of the observed output; $\gamma \equiv \lambda^2/[1+\lambda^2] \equiv \frac{\sigma_u^2}{(\sigma_u^2+\sigma_v^2)}$ [13]

The estimated value of γ is 0.82, which means that 82 percent of the differences between the observed and the maximum frontier output for sunflower production are due to the existing technical inefficiency among farmers. This indicates also that statistical noise plays an important role in the data (by 18%).

[13] According to Coelli et al., (1998) γ is not equal to the ratio of the variance of the technical inefficiency effects to the total variance term because the variance of u is not equal to σ_u^2 but $[(\pi-2)/\pi]\sigma_u^2$. Thus, the relative contribution of the inefficiency effects to the total variance term is equal to $\gamma = \gamma/\{\gamma + [(1-\gamma)\pi/(\pi-2)]\}$

Table 3.3 shows that a group of all factors used in sunflower production do significantly enhance efficiency levels, the test of overall significance of all factors, Wald ch.(4) = 298.23, and the p-value <0.001. It means that all the factors jointly predict the sunflower output reliably. The estimated Maximum Likelihood (ML) coefficients for farm size, labour, farm implement and seed input have expected positive sign(i.e. condition of monotonicity is fulfilled) and are highly significant indicating that more of these factors would increase the sunflower total yield. The output elasticities of farm size, labor, implement expenditure and seed, are .49, .25,.05 and .15 respectively. The test of the hypothesis that farms use constant returns to scale-technology cannot be rejected chi2 (1) = 1.08 Prob > chi2 = 0.2985. The variable farm-size appears to be the most important factor. It contributes the most to sunflower production followed by labour, seed and implements. However, the coefficient of the (logarithmic) expenditure on farm implements is only statistically significantly different from zero at the 10% level. Therefore, it cannot be concluded with certainty that the farm implements have a positive effect on the output quantity.

Correlation Matrix

A correlation matrix constructed using one dependent variable (the output) and four independent variables (farm size, seeds, labour and farm implements) as presented in Table3.4 indicates that, in general, there is very high positive correlation between output and the four explanatory variables taken together. This is expected given the results of the frontier regression results summarized in Table3.3. Below the correlation is the probability and looking at it, it can be said that, in overall, the correlation is significant at the p <0.001.

Table 3.4: Correlation matrix

	Yield (output)	Farm size	Seed	Labour	Implement(Capital)
Yield (output)	1.0000				
Farm size	0.5711*	1.0000			
	0.0000				
Seed	0.5286*	0.8133*	1.0000		
	0.0000	0.0000			
Labour	0.4173*	0.6442*	0.6020*	1.0000	
	0.0000	0.0000	0.0000		
Implement	0.3476*	0.3231*	0.2300*	-0.0501	1.0000
	0.0000	0.0000	0.0000	0.3173	

* Significant at 0.05 level or better. Below the correlation is the probability.
Source: Research data, 2012.

Source of Technical (in) efficiency in sunflower production

The literature points out that the inefficiency in agricultural production is often associated with factors related to demographic characteristics of household, farm characteristics, and the typical organizational and management norms of farmers themselves (Battese & Coelli, 1993; Forsund et al., 1980). Household characteristics in this study include; age of household head (higher age is hypothesized to lead to less efforts in use of resources under the farmer's control), household adult ratio (i.e. number of family members of working age to household size, to reflect household labour endowment) , education of the household head, experience in growing sunflower, non-agricultural asset value (to reflect household material wealth) and geographical location of the household (i.e. regional dummies[14] which are meant to capture possible differences in general physical and environmental conditions, e.g. soil fertility and weather conditions).

The farm characteristic included is household landholding (i.e. to reflect land endowment per household), included also is the land per household members endowment. It is important to recall that, they explained variable in the inefficiency function is the mode of inefficiency. A negative sign on a parameter indicates that the variable reduces the inefficiency, in other words, it has a positive efficiency

[14] Village 1: suguta. Village2: Iduo. Village3: Masinyeti. Village4: Chamkoloma. Village5: Tubugwe Kibaoni. Village6: Laikala. Village7: Ijaka. Village8: Ihanda.

effect. A coefficient with a positive sign on the other hand indicates the variable has a negative effect on technical efficiency (Kumbhakar et al., 1991).

Results as presented in Table3.5 indicate that technical efficiency in sunflower production is significantly influenced by; household size, education, household land endowment and the geographical location of the household. With regard to technical efficiency effects, a positive and statistically significant regression coefficient associated with household size suggests that large household with more dependants (children) than adults in the sample are likely to experience technical inefficiency in household production.

Despite increased use of animals in both cultivation and transportation of produce in the study area, there is still a great value/importance attached to family labour for certain farm activities particularly weeding and harvesting which require intensive labour during peak times, a household with many dependants and fewer workers is likely to be less efficient.

On the other hand, having a primary education and being endowed with land reduces technical inefficiency. The negative and statistically significant regression coefficient for education shows that education and in particular primary education play significant role in determining household production technical efficiency.

Table 3.5: Maximum likelihood estimates of the parameters for stochastic production frontier and the inefficiency effects model.

Dependent Variable: Natural log of Sunflower Yield in Kgs	Parameter	Coefficient	Robust Std. Err	z	P>|z|
Explanatory Variables: *Stochastic Frontier Production Model*					
Constant	β_0	4.165	.369	11.27	0.000***
Logged Farm size planted with sunflower	β_1	.520	.125	4.16	0.000***
Logged Labour input(in person days	β_2	.278	.107	2.60	0.009***
Logged farm Implement	β_3	.029	.012	2.42	0.015**
Logged seed input	β_4	.078	.098	0.79	0.428
Parameters: *Technical Inefficiency Model*					
Constant	α_0	.820	.662		
Age(*years*)	α_1	.013	.012	1.06	0.291
Household size	α_2	.148	.089	1.65	0.098*
Adult ratio in household	α_3	.835	.655	1.27	0.203
Education level 2(*1 if pr. educ,0 otherwise*)	α_4	-.705	.366	1.93	0.054*
Education level 3(*1 if Sec.edu,0 otherwise)*	α_5	.110	.668	0.16	0.869
Experience(*years growing sunflower*)	α_6	.043	.047	0.90	0.368
Non-agricultural asset value (inTshs)	α_7	-3.78e-07	5.16e-07	-0.73	0.464
$\boldsymbol{SAV_{means}1}$ (1 if f/insts, 0 otherwise)	α_8	.679	.734	0.92	0.355
$\boldsymbol{SAV_{means}2}$ (1 if assets, 0 otherwise)	α_9	-.200	.274	-0.73	0.465
Household Land endowment	α_{10}	-.004	.002	-1.67	0.094*
Land endowment per household member)	α_{11}	.179	.264	0.68	0.496
$\boldsymbol{v2}$ (1 if village2, 0 otherwise)	α_{12}	.407	.510	-0.80	0.425
$\boldsymbol{v3}$ (1 if village3, 0 otherwise)	α_{13}	-.748	.492	-1.52	0.128
$\boldsymbol{v4}$ (1 if village4, 0 otherwise)	α_{14}	-1.13	.612	-1.84	0.065*
$\boldsymbol{v5}$ (1 if village5, 0 otherwise)	α_{15}	-1.08	.555	-1.95	0.051*
$\boldsymbol{v6}$ (1 if village6, 0 otherwise)	α_{16}	-1.75	.738	-2.37	0.018**
$\boldsymbol{v7}$ (1 ifvillage7, 0 otherwise)	α_{17}	-.457	.549	-0.83	0.405
$\boldsymbol{v8}$ (1 if village8, 0 otherwise)	α_{18}	-1.41	.523	-2.71	0.007***
Number of observations		400			
Wald chi2(4)		153.69			
Prob > chi2		0.0000			
Log likelihood		406.95427			
Sigma_v		.5397733	.069		

*, **and*** represent significance at10%, 5% and 1% respectively

Source: Research data, 2012.

In spite of being lower level, primary education appears to have been useful in enhancing utilization of existing knowledge and farming skills; 74% of the sampled households have primary level education.

Empirical literature regarding education and technical efficiency often reveals mixed results. The study by Msuya and Ashimogo (2005), Battese and Coelli, (1995), Bravo-Ureta and Evenson (1994.) find that education reduces inefficiency. It is argued in those studies that education increases information and the ability of a farmer to use the existing education, a fact which improves their technical efficiency level. In other studies however, education is found to increase technical inefficiency (Bravo-Ureta & Pinheiro, 1997; Rahman & Umar, 2007). It is explained that once a farmer attains a higher or better education, he tends to search for better income generating activities outside the farm, labour available for farm activities is reduced and technical efficiency falls.

The negative and statistically significant regression coefficient for household land endowment implies that households with large land endowment tend to have lower technical inefficiency than households with small land endowment (i.e. with land scarcity). The likely explanation for this finding could be that most households in the sample have landholding endowment that does not tally with amount of other household resources. The average land endowment per house hold is 8.42 acres while the mean household size is 5.38 persons, an average of land endowment per household member of 1.56 acres but if it is assumed there is equitable land distribution in the villages. In the first place, this land per person is small; and in addition, land is not in reality equitably distributed.

Households with large land endowment are likely to be efficient due to potential utilization of available family labour while households with small land endowment under-utilize their family labour as argued in Key and Runsten (1999) that, in most developing countries family labour is non-tradable, particularly that of children and female members of the household due to missing markets. In such situation a household with large land endowment tends to be efficient due to potential utilization

of available family labour. They have access to the *'unremunerated*' family labour for which markets are missing. Households in developing countries often have large families (Key & Runsten, 1999). Households with small land endowment on the other hand, under-utilize their family labour. This is especially true because often poor households have no financial ability to rent in or buy land.

Furthermore, significant coefficient with expected sign associated with land endowment could as well be revealing the freedom of choice households with large endowment have in land asset allocation. Households with lager land asset are able to grow different crops apart from sunflower, (the cash crop) by dividing the land into plots for different crops. This enables households to grow for example food crops to strengthen household food security. This is important and useful for, in some ways it reduces production risk and improves production efficiency of the contract crop produced solely for household cash earning.

This is an outcome that is very likely given that agricultural contracts practised in the study area have characteristics of being uncertain and incomplete in their design as elucidated in chapter two. The need to meet household food consumption often takes priority over cash considerations. With a larger land holding, therefore a household is able to grow both cash earning crop and staple food. Moreover, households with enough land can lease part of it to earn money which can be used to buy inputs and services, to enhance production and thus, eventually improving technical efficiency and productivity.

The research site covered four wards, which are adjacent to each other as can be seen in Figure 1.2 in chapter one. Villages surveyed are homogenous in terms of general physical environmental conditions. In spite of that; there can still be some geographic characteristics of the locality, which differ from one village to another, which may affect individual household technical efficiency level.

Village dummies serve to control for such remaining differences e.g. soil fertility and weather conditions; 4 out of 7 village dummies significantly reduce the technical

efficiency. As one moves from Suguta, the reference village in Iduo ward towards Chamkoloma, Tubugwe Kibaoni, Laikala and Ihanda villages, technical inefficiency tends to decrease. Basing on the observation conducted during the survey, the remaining villages; Iduo, Masinyeti and Ijaka depicted much drier climatic conditions than in other villages. The sign and magnitude of the coefficients for these villages as indicated in Table 3.5 are thus not surprising.

With regard to technical efficiency effects, age, household adult ratio, means of savings, non-agricultural assets and experience in growing sunflower are shown to have no effect on technical efficiency of production.

Technical efficiency distribution

From the econometric estimation of equation(x) technical efficiency score (TE) is predicted and results as presented in Table3.6 indicate that technical efficiency score (TE) of household sunflower farmers in the study area ranges from 4% to 99% with a mean technical efficiency of 66% and standard deviation of 16%.

Table 3.6: Summary statistics of technical efficiency score (TE)

Status of farmers	Obs	Mean	Median	Std .Dev	Skewness	Kurtosis	iqr	Min	Max
Non-Contract farmers	195	.64	.66	.16	-.59	3.24	.19	.15	.99
Contract Farmers	205	.68	.71	.16	-1.40	5.8	.18	.04	.98
Overall	400	.66	.62	.16	-.97	4.23	.18	.04	.99

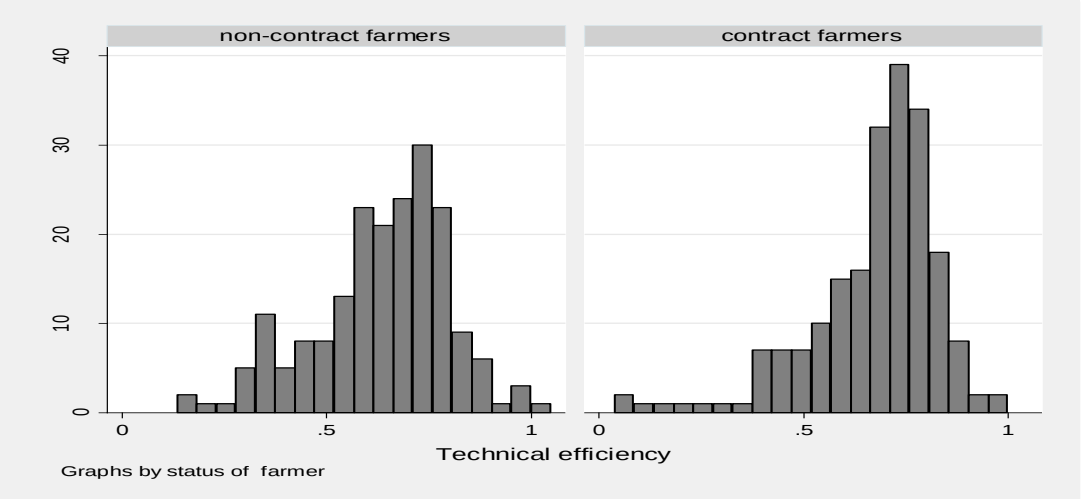
Source: Research data, 2012.

This suggests that the average sunflower household in the area (in pooled sample) is 34% below the production frontier. It means that there is a scope for the households in the study area to increase their productivity and returns from sunflower production by improving their efficiency while using the same technology in use.

Looking at the median values, Table 3.6 reveals that contract and non-contract farmers have median technical efficiency scores of 71% and 66% respectively, which

are bigger than the associated technical means value of 68% and 63% respectively indicating negative skewness in their distributions. The difference between median and the mean scores among both contract and non-contract farmers is the same (0.3) , suggesting there is almost similar distribution of technical efficiency among contract and non-contract farmers as can be seen in Fig3.2

Figure 3.2: Technical efficiency distributions



Source: Research data, 2012.

The range of individual efficiency score differs between contact and non- contract households. The standard deviation of .186 for contract farmers is slightly bigger than .17 for non-contract farmers, suggesting that contract farmers may be a bit more variable in their efficiency scores than in non- contract farmers. The interquartile ranges of .18 and .19 for contract and non-contract farmers respectively indicate that there is very slightly more dispersion of the middle 50 percent among the non-contract farmers than in the contract category.

3.4.3 Technical efficiency effects of contract

The difference in technical efficiency score may not be solely attributable to contract participation due to potential selection bias arising from some observable factors, which may be simultaneously influencing both participation and technical efficiency. If participation in contract farming were randomized, the counterfactual situation would be observed, making it possible to drive causal inference. However, with

cross-section data as is the case with this study, it is not possible to observe counterfactual outcome. Thus, to address selection bias, this study adopts propensity score matching method. This technique of analysis is also extended to determine contract effects on another related variable of interest in this study the land productivity which also depicted significant differences attributable to contract participation as revealed in section 3.4.1 based on results presented in Table3.2.

Use of propensity score matching method in estimating the impact of contracts on outcome variables of interest, the technical efficiency follows the steps of Backer and Ichino (2002). It involves in the first place, modelling of the probability of being a contract farmer. Logit (weighted) estimation of propensity score is applied. Pre-determined variables influencing both probability of participating in contract and the outcomes, as explained in section 3.3.3 are included. From this weighted logit model, propensity score is generated. This is then used to match contract farmers against non-contract farmers on outcome variables to draw some causal inferences about the ATT as explained in section 3.3.3.

Results in Table3.7 show that, in overall, the model is significant as expressed by Wald chi-square test (20) =69.18, $p<0.001$ and Pseudo-R^2= 0. 1010. However, the Pseudo-R^2 at 10.1% is low, indicating that although the model is significant, it only accounts for a small part of the variability of the dependent dummy variable, the contract participation. This suggests that, the data set may be lacking the best predictors of contract choice, and this can be realised from Table3.7, whereby many of the predictors do not individually come out statistically significant.

It is, however, argued in the evaluation literature that, in propensity score matching, trying to achieve balance on relevant predictors is more important than taking trouble trying to mode the selection process (Argurzky & Schmidt,2001; Khandker, Koolwah, & Samad, 2010; Kiluve, Lehmann, & Schmiat,2002) as cited in Venetoklis (2004). This is also because for contracts, for example, there are explicit terms which are often reinforced by numerous unwritten rules, and implicit incentives

which make it difficult to find observational data that captures every important aspect of the contract environment (Wu & Roe, 2007).

Table 3.7: Logit (weighted) estimation of propensity score

Dependent variable: *contract participation dummy*	**Coef**	**Robust Std. Err**	**P>|z|**
Explanatory variables:			
Age (*years*)	.023	.011	0.04**
Household size(number of persons in the household)	.059	.089	0.51
Experience in growing sunflower	-.003	.039	0.944
P/education(having primary education=1,0 otherwise)	.419	.296	0.157
S/education(having secondary education=1,0 otherwise)	1.13	1.05	0.283
Household land endowment	-.056	.035	0.114
Land endowment per household member	.350	.208	0.092*
Value of non-agricultural assets in Tshs	-1.85e-08	1.60e-08	0.248
Having a bank account(1=yes, 0 otherwise)	-2.26	.636	0.000***
Savings2(1= if f/inst,0 otherwise)	-.801	.700	0.253
Savings3 (1 if assets,0 otherwise)	.702	.243	0.004***
Dummy1 f (1 if village1, 0 otherwise)	1.26	.428	0.003***
Dummy2 (1 if village2, 0 otherwise)	1.26	.400	0.002***
Dummy3 (1 if village3, 0 otherwise)	1.31	.394	0.001***
Dummy4 (1 if village4, 0 otherwise)	.731	.391	0.062*
Dummy5 (1 if village5, 0 otherwise)	.774	.404	0.056*
Dummy6 (1 if village6, 0 otherwise)	-.361	.494	0.465
Dummy7 (1 if village7, 0 otherwise)	-.651	.525	0.214
Constant	.048	1.49	0.974
Number of observations 400			
Log pseudo likelihood = -159.95498			
Wald chi2(20) = 69.18			
Prob > chi2 = 0.0000			
Pseudo R2 = 0.1010			

,**, significant at the 10%, 5% and 1% levels respectively:

Source: Research data, 2012.

Examination of the logit model indicates that, among all the predictors in the model as presented in Table 3.7, only age, land endowment per household member and having economic ability to make savings by means of purchasing assets including stocks of seasonal crop harvest for future re sell or exchange, significantly favour participation in the contract. Contract production of sunflower appears to be more attractive to elderly farmers than it is to young farmers. This is as hypothesized in section 3.3.4. This could be explained by the fact that, farmers with advanced age might be feeling less mobile and less likely to make living outside their villages. Therefore, contract farming initiatives in villages provide opportunities which tend to be more attractive to them.

Households with large land per household member tend to have high likelihood of self-selection into contracts. The explanation could be that, if a household has large land per household member, it might be willing to contract because this household can benefit from economies of scale associated with large farmland when contract arrangement is meant to enhance productivity. But also, if a household has large land per household member it can easily allocate land for food production and manage to remain with another piece of land large enough for commercial production through contract farming.

Households who can save by means of durable assets including crop stocks are also likely to self-select into contract farming scheme. These households are considered to be wealthy households who can easily transform their assets into resources needed to finance contract farming particularly in situation where contracts are incomplete in their design. Often for example, stock of cereals like maize is exchanged for hired labour badly needed during weeding session. This makes sense given fact that sunflower production process is usually labour intensive activity.

Owning a bank account explains negatively the probability of participating in the contract. The explanation could be that, contracts are less attractive to households who are not cash strapped. This might be because they can afford buying farming

resources with their own money. Farming contracts, which are largely resource (seed) providing contracts, may not be attractive to such households

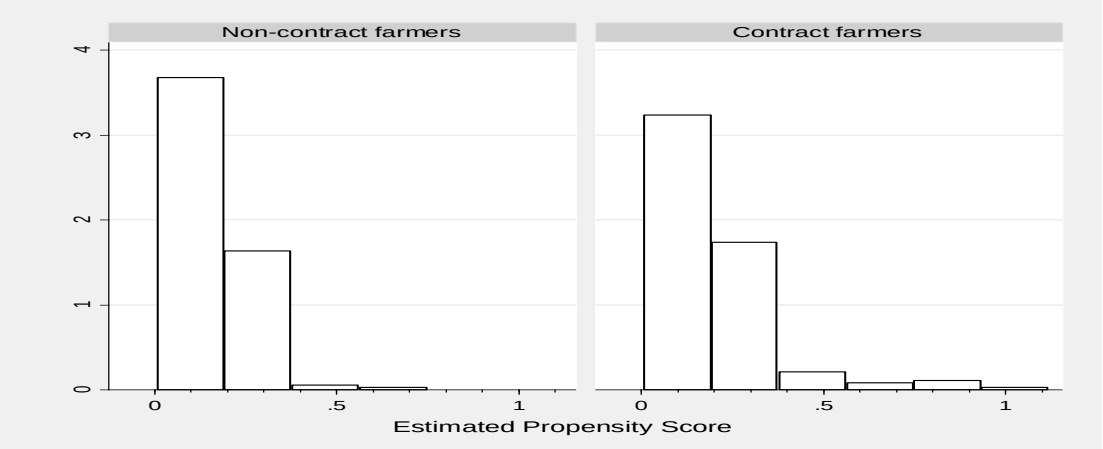
Village dummies for villages one to five have positive and significant coefficients, indicating that other things being equal, locations of these villages with reference to village 8 (Suguta village, a reference village) favour contract participation. These villages are situated along the main road entering the villages from Dodoma regional town where contracting firms are based via Kibaigwa, the large local rural market place serving all villages in Kongwa district and other nearby districts. Households in these villages appear to be advantageous in terms of information access particularly, the information related to companies offering contracts in the area, and the markets. In contrast, coefficients for the two villages of Laikala (Village6), Ijaka (Village7) whose locations are far away from this main road are negative, suggesting that, location in these villages which are far away from this main road by a household tends, although insignificantly to lower the probability of participating in agricultural contracts.

Other variables; household size, education of the household head, experience in growing sunflower, value of non-agricultural assets and amount of total land owned by a household (land endowment per household) do not significantly explain participation in the contract.

3.4.4 Matching and impact estimations

Having generated the propensity score, it is important to examine its distribution. Figure 3.3 indicates that the propensity scores is quite similar in the contract and non- contract farmers. This is necessary to ensure that there are good matches.

Figure 3.3: Distribution of propensity scores for non-contract (left) and contract farmers (right).



Source: Research data, 2012.

It is important to ensure that there are balancing scores within the common support region before proceeding to estimate the average effect of treatment on the treated (ATT). This is done by discarding treated individuals with a propensity score lying outside the common support restriction. The region of common support in this data is [.01911637, .93316652] and its detailed summary is as described in Table3.8

Table 3.8: Description of the estimated propensity score in region of common support

Estimated propensity score				
	Percentiles	Smallest		
1%	.02186	.0191164		
5%	.0333034	.0199475		
10%	.0477531	.0215964	Obs	399
25%	.0858596	.02186	Sum of Wgt.	399
50%	.155941		Mean	.1772523
		Largest	Std. Dev.	.1320227
75%	.2351803	.7968217		
90%	.3154769	.8012924	Variance	.01743
95%	.3766117	.8108296	Skewness	2.138178
99%	.7968217	.9331665	Kurtosis	10.23555

Source: Research data, 2012.

With Skewness at 2.1 and Kurtosis at 10.2, Table3.11 further indicates that, the issue of normality in the distribution of propensity is score is not generally problematic. Balancing hypothesis is therefore likely to hold well.

Identification of the optimal number of blocks

The final number of blocks is 6. This is the number of blocks that ensures that the mean propensity score is not different for treated and controls in each block. This also means that each predictor used in the logit model does not differ between the two groups. Table3.9 shows the inferior bound, the number of treated and the number of controls for each block. The balancing property in this analysis is satisfied. Final blocks are defined and the common support option has been selected.

Table 3.9: Distribution of contract and non-contract farmers based on blocks of propensity score

Inferior of block of propensity score (with common support)	**whether a household is in contract or not**		**Total**
	0	1	
.0191164	135	128	263
.2	49	37	86
.3	7	25	32
.4	2	8	10
.6	1	4	5
.8	0	3	3
Total	**194**	**205**	**399**

Note: the common support option has been selected.

Source: Research data, 2012.

Effect of contracts on technical efficiency and land productivity: the ATT

Finally, this section measures the actual effects of contracts on technical efficiency using Propensity Matching Score Method (PMS). This study uses the most widely used matching algorithms, the nearest neighbour matching (NNM) where each treatment unit is matched to the comparison units with closest propensity score. However, in order to check for the robustness of the NNM estimate, the Kernel-based matching method (KBM) is also applied. The magnitude of ATT point estimate is examined, but also the sign, and whether the estimated ATT points are

statistically significant. The 5%level of significance is chosen as the cut-off point. Thus, given the number of observations and the degree of freedom, t-statistics that are over 1.96 denote statistical significance of ATT estimates.

Nearest-Neighbour Matching Method (NNM)

Table3.10presents results of comparison between contract and non-contract farmers matched by the Nearest-Neighbour Matching Method (NNM). 205 contract farmers are matched with 109 non-contract farmers. The ATT is shown for technical efficiency score and land productivity. With regard to technical efficiency the results in Table3.10indicate that, contract farming has significant positive effect on technical efficiency level of farmers. The ATT estimated by NNM method suggest that contract farmers are on average 7.4% higher in technical efficiency score than non-contract farmers. This difference in technical efficiency score is statistically significant at 5% level and above. Standard errors are obtained by bootstrapping using 100 replications. Similarly, the results in Table3.10indicate that contract arming significantly increase land productivity (yield per acre) via improved technical efficiency. Contract famers have on average 25.5 more kilograms of sunflower yield per acre than the non-contract farmers. The result is statistically significant at 5% level or better.

Table 3.10: Average treatment effects on the treated: NNM

Matching algorithm	Outcome	ATT	Std. Err.	t-value	No.of treated	No.of control
NNM	Technical efficiency	0.074***	0.031	2.55	205	109
	Land Productivity	25.456**	11.533	2.20	205	109

****,***** significant at 5% and 1% levels respectively

Source: Research data, 2012.

*Kernel-Based Matching Method (KBM***)**

To assess the robustness of the results another quite widely used technique of matching based on propensity score, the Kernel-Based Matching Method (KBM) is applied. Table 3.11 shows results obtained by (KBM). Standard errors are obtained by bootstrapping using 100 replications because analytical standard errors could not be computed. The 205 contract farmers are matched with 194 non-contract farmers. Compared to nearest-neighbour matching (NNM), the results obtained by KBM method for technical efficiency and productivity are statistically significant and appear to be close to the results obtained by NNM method.

Table 3.11: Average treatment effects on the treated: KBM method

	Outcome	ATT	Std. Err	t-value	No. of treated	No. of control
KBM	Technical efficiency	0.058 ***	0.018	3.290	205	194
	Land Productivity	20.883 **	7.865	2.655	205	194

****,***** significant at the 5% and 1% levels respectively.

Source: Research data, 2012.

The results in Tables 3.10and 3.11, taken together, present consistent evidence that contract farming has positive significant impact on technical efficiency in the range of 5.8 – 7.4% and land productivity 20-25Kgs. Furthermore, since results in Table3.3 suggested that there was no selectivity bias, based on evaluation of time invariant characteristics. This suggests that, estimation of the effect of contracts on variables of interest; technical efficiency and land productivity could as well be performed by using Ordinary Least Square Method (OLS) on the survey data without having to correct for selectivity bias. Results would equally be unbiased and consistent. Table3.12 shows results obtained by OLS method. Standard errors indicated are robust as the sample is weighted. Compared to results from matching methods NNM and KBM, results by OLS method are similar in terms of sign, significance, though with slight difference in magnitude revealing the significance of carrying out treatment effect analysis.

Results shown in Tables 3.10 and Table3.11, suggest that in overall, participating in contract farming lead to an average increase in technical efficiency of a farmer by 4.5 - 7.4 percent. And this impact is significant at 5% level and better (t-value=2.55 or 3.29). Similarly contract participation increases land productivity of a famer by an average, in the range of 20.8Kgs - 25.1Kgs per acre. This impact is significant at 5% (t-value = 2.207 or 2.655).

And based on the mean yield per acre and technical efficiency level statistics of both contract and non-contract farmers as summarised in Table 3.2, the expected output(total factor productivity) per acre of an average contract farm is computed as 121.5*0.68 = 82.6 Kgs, while that of a non-contract farm is equal to 103.8*.64 =66.4 Kgs. Thus, other things being equal an average contract farm produces82.6/66.4 -1 = which is equal to 24% more sunflower per acre than non-contract farm.

Table 3.12: Average effects of contracts on the treated: OLS method

Method	Outcome	Effect	Robust Std. Err	t-value	No.of treated	No.of control
OLS	Technical efficiency	.045**	.01	2.30	205	195
	Land Productivity	15.04*	8.27	1.82	205	195

,* significant at the 10% and 5% levels respectively.

Source: Research data, 2012.

3.5 Discussion and conclusion

Findings of this study present important insights about functioning of contract farming and its effect on smallholder farming. It has been shown that contract farming of sunflower production in Kongwa district generates higher technical efficiency and increased yield (productivity) to households.

Examining the magnitude of the estimated effects of contract on variables of interest, one might argue that the effects are not substantial enough to reflect the real potential of contract farming in raising technical efficiency as revealed in other studies egRuben and Saenz (2008).However, the fact that the results are positive and significant is of particular importance. Small, but significant effects could be pointing to the fact that present sunflower production contracts practiced are still

confronting some problems. As discussed in chapter two, contracts practiced are by their design largely deficient, both farmers and firms are extremely financially constrained. For example, despite that farmers need several types of inputs such as seeds, pesticides and fertilizers for improved productivity, only seed input is involved in present contractual agreements. Firms cannot expand their facilitation role to match farmers' basic demands they would like to have in contracts. Moreover, even the specified agreements in present contracts are not adequately fulfilled by the firms, for example, despite that better seed is promised in contractual arrangements, only few farmers eventually receive sufficient quantity of seed they need. The rest obtain fewer amounts than they need due to limited supply of inputs by the contractor. Farmers as a result, are forced to mix seeds, using both t improved and local inferior seed varieties to satisfy their seed needs. This affects negatively productivity and returns of farmers.

These findings are particularly important, given the role of agriculture in Tanzanian economy and the recent agricultural development policy boost of *Kilimo kwanza* initiatives. In an era of dying faith in cooperatives and other traditional forms of farmers production and marketing organisations, along with the growing market oriented business environment in Tanzanian economy, contract farming system presents a great potential for sustainable development of small scale farming sector that can transform lives of smallholders, particularly those residing in rural parts of the country.

Both government and farmers should seize this opportunity in order to reap the potential benefits of contract farming. Government in particular should effectively play the enabling role by adjusting the existing financial regulatory regime to create desirable and friendly business environment that will reduce transaction costs of agribusiness firms attracted in contract farming business. Provision of loans and credit to private business firms should be encouraged.

Results by OLS method are slightly inferior compared to results obtained by NNM and KBM procedures; this validates the robustness of the results and usefulness of

the propensity score method in impact analysis. The method has the strength that, it reduces bias by matching treatment and control households on the basis of observable covariates (Khandker et al., 2010). It assumes that selection bias is based on observed characteristics. This study therefore, contributes to technical efficiency and productivity literature by implementing propensity matching technique, a non-experimental method with strength to address the problem of selection bias inherent in many observational data, a method that is relatively new in agricultural production economics studies.

CHAPTER FOUR

EFFECTS OF CONTRACT FARMING ON INCOME OF SUNFLOWER FARMERS IN KONGWA DISTRICT

4.1 Introduction

This chapter investigates the causal effect of contract farming on the income of small-scale sunflower farmers in Kongwa District. Review studies on contract farming schemes (Minot, 1986; Prowse, 2012) show that contracts, in most cases, improve the income of participants. But many of these studies do not take into account the fact that farmers self-select into contract farming. Participation in contract farming is a matter of individual choice, as such there is always self-selection.

Contract farming programme like other intervention programmes is often purposeful and is initiated in accordance with the community needs. Individuals therefore self-select into the programme given its design and placement (Khandker et al., 2010). Programme participants therefore are generally not a random sample of the population because of purposive program placement and self-selection into the programme (Khandker et al., 2010).

Observable and unobservable characteristics of participants may therefore have direct effect on outcome. If for example, a contract farmer is knowledgeable on agronomics of a particular crop than non-contract farmer, he would have higher productivity and income even if he was not exposed to contract farming programme, the income that reflects effects of contract farming together with effect of household knowledge would be biased.

Naïve regression analysis that counts participation as an exogenous variable in outcome equations are likely to produce parameter estimates that are bias and inconsistent because participation involves a personal choice, it is therefore a dummy endogenous variable that needs to be modeled first and the results subsequently used

to estimate the coefficients of the outcome equation. Without modeling this dummy variable first, the regression of outcome showing the impact of contract would be biased, regardless of whether the regression model controlled for other factors (Guo & Fraser, 2015). There are only a few studies that analyse the causal effects of contract farming correcting for selection bias from observable and unobservable characteristics eg (Miyata, Minot and Hu,2009; Chang, Chen, Ching and Tseng, 2006).

4.2 Empirical literature on contract farming and income

Many studies, Warning and Key (2002), Miyata et al. (2009), Rao et al.(2012) on CF take into considerations as to whether smallholder farmers involved in contract farming have been able to improve their income and their household general welfare. Results from empirical studies are mixed. Warning and Key (2002) examined CF of peanuts in Senegal and found that farmers who participated in contracts managed to access inputs such as; improved seed, fertilizer and extension services from the contracting private agribusiness firm, and as the result, they were able to increase productivity and income. The assured procurement, and higher prices for their produce made them achieve agricultural revenue that is about 55percent higher than the average agricultural revenue of the non-contract farmers.

Through contract farming, farmers of apple and green onion in Shandong province of China got access to product market; reliable supply of farm inputs, extension services and a risk sharing arrangements which favour improvement in productivity and income (Miyata et al., 2009). Ramaswami et al. (2005) indicate that, it was essentially the improved technology and management practices enhanced through contract production which led to lower feed-conversion ratio which increased income from increased volume poultry products in the state of Andhra Pradesh in India. Little (1994) finds also that CF on average increases the income of participants by 30 to 60%.

Other studies, however, indicate that, while CF generally improves the income of farmers and in some ways, it does so at the cost of increasing exclusion and inequality among farmers (Key & Runsten, 1999; Sigh, 2002). The study by Key and Runsten (1999) on CF of frozen vegetable crops broccoli and cauliflower in Mexico indicated how market imperfection and transaction costs influence decision making in contracts. Many companies found it easier and profitable to work with few better-off and large growers rather than dealing with a pool of small scale poor growers. Transaction costs associated with provision of inputs, credit and extension services, produce collection and grading are excessive when compared with the potential returns associated with small scale farmers.

In Zimbabwe, Cotton scheme required applicants to demonstrate that they can achieve a specified minimum volume of production before being accepted to the scheme, an arrangement that tended to exclude poor smaller farmers (Coulter, Goodland, Tallontire, & Stringfellow, 1999). Companies were willing to contract small growers only when other alternatives are not available. It is nevertheless suggested by Key and Runsten (1999) that, appropriate contractual arrangements can still be profitable for the company even with the smallholder growers provided that it is possible to organize farmers into producer groups. Dealing with groups rather individuals is potentially cost effective.

Moreover, in certain other contractual relationships studied where farmers were found to be restricted from growing crops other than the contract crop, frequent shortage of food at household level was found to be a pertinent issue (Glover & Kusterer, 1990). Other studies however, find a weak connection between contract and income (Little& Watts, 1994).

Overall, as review studies (Oya, 2012; Minot, 1986; Prowse, 2012) indicate, CF in most cases results in positive impacts on farmers involved. CF is found to provide farmers with market access that would otherwise not have been available to them. There is an increase in income of farmers associated with increased volume of sales and higher price in the contract schemes. Contracting firms on their side are able to

control quality, volume, standard, and insure steady supply of the contract produce. By design they are able to benefit from contract production at the generally minimized transaction costs particularly when they are able to organize farmers into producer groups.

4.3 Econometric models and data analysis

The selection equation model

Determination of the impact of contract on variable of interest, the income in this study, makes use of a one-step maximum likelihood analysis in which both participation and outcome equations are jointly estimated. It is argued that proper estimation of program effect requires in the first place to establish factors which determine why some households participate in the programme (i.e. contract farming) while others do not even though a program is freely available to all in the village (Khandker et al., 2010). Without such information it is difficult to compare or asses the difference over the variable of interest (e.g. income) between the two groups because the observable difference in outcome could be arising from the underlying differences across each group which existed before the programme, which can bias comparison across the two groups (Khandker et al., 2010; Miyata et al., 2009; Guo & Fraser, 2015).

Therefore, a binary variable probit model is used to identify factors predicting participation of household in contract, where a dependent variable (i.e. contract participation) that takes a value of 1 if a household participates in contract and 0 otherwise is regressed against the factors considered (hypothesized) to be associated with participation decision and income, which, usually are pre-determined factors (i.e. factors that are not influenced by expected benefits of participation). These include household characteristics, and characteristics of the farm namely age, education, experience, household size, farm size, proportion of adults in the household, land endowment per household members, value of non-agricultural asset owned, household land endowment, owning a bank account and the means of

household savings.

A decision by a household as to whether or not to join a contract is modeled as a self-selection problem. Impacts of contracts on outcome are observable only if a farmer participates in contract, and effects on outcome are not observable if a farmer does not participate in contracts. Selectivity is thus inevitable, and modeling of selection effects is indispensable. The potential self-selection bias is addressed by applying an approach which involves joint estimation of two equations, the 'outcome' equation that is used to estimate income for households in a sample and a 'selection' equation which estimates the likelihood that a household with a given set of characteristics participates in contract; (Heckman, 1979; Heckman & Vytlacil, 2005; Guo & Fraser, 2015).

The unobserved selection factors according to Heckman (1979) are treated as a problem of specification error or a problem of omitted variables and corrected for bias in estimation of the outcome equation by explicitly using information gained from the model of sample selection.

It follows then that;

The outcome equation:$y_i = a + \beta X_i + + \varepsilon_i$ observable only when w_i=1----------(i)

Selection equation: $w_i^* = a + \beta X_i + Z_i\gamma + u_i,\ w_i = 1$ if w_i^*= 0 and w_i=0 otherwise----------(ii)

Where;

X_i = is a vector of exogenous variables determining outcome y_i

w_i^* =is a latent endogenous variable. If w_i^* is greater than the threshold value,ψ, then the observed dummy variable $w_i = 1$, and otherwise $w_i = 0$; the outcome equation observes value y_i only for $w_i = 1$

Z_i =is a vector of exogenous variables determining the selection process and

$\varepsilon_i$andu_i are error terms of the two regression equations, assumed to have zero means and the variances σ_ε^2andσ_u^2 respectively.

Prob ($w_i = 1|Z_i$) = $\Phi(Z_i\ \gamma)$ and Prob($w_i = 0|Z_i$) = $1 - \Phi(Z_i\ \gamma)$

And given that the sample in this study was a response based sample, a weighted sample as computed in chapter three is used to overcome the potential sample selection bias arising from non-proportional stratified sampling on the response.

Table 4.1: Description of Variables in the participation decision function

Variable Category	Variable Name	Parameter	Variable label and Measurement
Contract participation	$PARTICIPATION(I_i)$		a dummy variable having a value of 1 if a i^{th} farmer participated in contract and 0 otherwise
$\boldsymbol{Z}\_variables$	(1) AGE	α_1	Age of household head in years
	(2) AGE^2	α_2	Age squared of the household
	(3) SEX	α_3	Sex of a household head 1 if woman and 0 otherwise
	(4)EDU	α_4	Education level of a household head: a Categorical variable having a value of 1 for a given education level and 0 otherwise
	(5) $HHSZ$	α_5	Number of household members
	(6) $ADULT$	α_6	Proportion of adult members to total household size
	(7) $LAND_{endow}$	α_7	Total land owned by a household in Acres
	(8) $Per\ capita_{land}$	α_8	Land endowment per household members(acres)
	(9)$EXPER_{SUNF}$	α_9	Experience of growing sunflower in years
	(10)$NonAgr_{asset}$	α_{10}	Non-Agricultural assets owned in Tshs.
	(11)SAV_{means}	α_{11}	Household means of saving: a dummy variable having a value of 1 if financial institutions and 0 otherwise; 1 if assets/crops and 0 otherwise.
	(12) $BankAC$	α_{12}	Having a bank account: a dummy variable having a value of 1 if Yes and 0 otherwise
	(13) v_1	α_{13}	a dummy variable having a value of 1 if a household lives in village 1 and 0 otherwise
	(14)v_2	α_{14}	a dummy variable having a value of 1 if a household lives in village 1 and 0 otherwise
	(15)v_3	α_{15}	a dummy variable having a value of 1 if a household lives in village 3 and 0 otherwise
	(16)v_4	α_{16}	a dummy variable having a value of 1 if a household lives in village 4 and 0 otherwise
	(17)v_5	α_{17}	a dummy variable having a value of 1 if a household lives in village 5 and 0 otherwise
	(18)v_6	α_{18}	a dummy variable having a value of 1 if a household lives in village 6 and 0 otherwise
	(19)v_7	α_{19}	a dummy variable having a value of 1 if a household lives in village 7 and 0 otherwise
	(20)v_8	α_{20}	a dummy variable having a value of 1 if a household lives in village 8 and 0 otherwise

Source: own construction, 2014.

The empirical model for estimating the decision to join the contract against the choice to produce independently is specified as follows:

$$I = \alpha_0 + \alpha_1 AGE + \alpha_2\, AGE^2 + \alpha_3 EDU + \alpha_4 HHSZ + \alpha_5 ADULT + \alpha_6 LAND_{endow} + \alpha_7 Per\ capita_{land} + \alpha_8 EXPER_{SUN} + \alpha_9 NonAgr_{asset} + \alpha_{10} SAV_{means} + \alpha_{11} BankAC + \alpha_{12} v_1 + \alpha_{13} v2 + \alpha_{14} v3 + \alpha_{15} v4 + \alpha_{16} v5 + \alpha_{17} v6 + \alpha_{18} v7 + \varepsilon \quad (iii)$$

However, the ultimate objective of the study in this chapter is to determine the contract effects on household income (the treatment effect). The fundamental econometric problem in the efforts to estimate treatment effects is the problem of selectivity bias (i.e. self-selection bias), which arises from the fact that treated individuals differ from the non-treated for reasons other than treatment status per se. The first attempt in efforts to estimate the income effect of contract would be considering applying the OLS method.

Estimation of the income equation that includes contract participation as a dummy variable using ordinary least square (OLS) would yield inconsistent and biased results. This is because, with the ordinary least square (OLS) method, it is not possible to control for selectivity bias. Results from OLS estimation would be biased upward or down ward, depending on whether, there was bias upward or downward in selection of the participants into the contract programme (Miyata et al., 2009).If for example, contract households tend to be households of industrious people, they would have higher income regardless of whether they participate in contracts or not. The regression coefficient for participation dummy variable would include the effect of the non-observable variable diligence; hence overestimating the effect of contract participation. It is therefore, important to adjust for selectivity bias in order to discern the treatment impact and obtain consistent results.

The final component in the analysis therefore, entails specification of a model that determines the causal effect (treatment effect) of a binary variable (contract) on an outcome variable (income) adjusting for selectivity bias. The model attempts to estimate the probability of a household being in one of the two conditions indicated by the endogenous dummy variable (contract), and then use the estimated probability of participation to estimate the coefficients of the outcome regression model.

The treatment effect model

The analysis in this chapter adopts the treatment effect model (Heckman &Vytlacil, 2005) to measure the treatment effect of contract participation on income. The treatment effect model is the augmented form of the Heckman sample selection type models (Green, 2003). The treatment effect model differs from the sample selection models in that, a dummy variable indicating the treatment conditionI_i (i.e.$I_i = \alpha_i + \gamma Z_i + u_i$, where I_i = 1 if participant $i$is in the treatment condition, and I_i = 0 otherwise) is directly entered into the outcome regression equation given as $y_i = \beta_0 + \beta_i X_i + I_i\delta + \varepsilon,$ and the outcome variable y_i of the regression equation is observed for both I_i= 1 and I_i = 0. Thus, the treatment effect model is the model that is expressed in two equations:

The outcome equation: $y_i = \beta_0 + \beta_i X_i + I_i\delta + \varepsilon - - - - - - - - - - - - - (iv)$

Selection equation: $I_i^* = \gamma_i Z_i + u_i,\ I_i = 1$ If $I_i^* > \psi$ and $I_i = 0$ if $I_i^* \leq \psi$

Where;

y_i= outcome variable which is observable for both I_i= 1 and I_i = 0.

$x_i =$ Vector of explanatory variables in the outcome equation

$I_i^* =$ a latent variable $I_i = 1$ If $I_i^* > \psi$ and $I_i = 0$ otherwise.

$Z_i =$ is a vector of explanatory variables in the selection equation

$\varepsilon_i and\ u_i$, are bivariate normal with mean zero and covariance matrix$\begin{bmatrix} \delta_\varepsilon & p \\ p & 1 \end{bmatrix}$

Pr($I_i = 1|Z_i$)= $\Phi(\gamma_i Z_i)$ and Pr($I_i = 0|Z_i$)= 1-$\Phi(\gamma_i Z_i)$

The model assumes that the level of correlation between the two error terms$\varepsilon_i and\ u_i$, is nonzero, and violation of that assumption can lead to estimation bias (Guo & Fraser, 2015). It is often necessary to conduct a likelihood ratio test

against the null hypothesis that H0: $p = 0$. This ratio test is a comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed data against the treatment effect model.

The model expressed by Equations(i) and $(ii)$is a switching regression (Guo&Fraser, 2015). By substituting I_i in Equation (i) with equation(ii), two different equations of the outcome regression are obtained:

When, $I_i^* > \psi, I_i = 1 : y_i = \beta_0 + \beta_i X_i + (\gamma_i Z_i + u_i)\delta + \varepsilon - - - - - - - - - (v)$

When $I_i^* \leq \psi, I_i = 1$: $y_i = \beta_0 + \beta_i X_i + \varepsilon - - - - - - - - - - - - - - - - (vi)$

The switching regression model has two regimes: treatment and non-treatment regimens with separate models for the outcome under each regime, which can either, be jointly estimated by maximum likelihood estimation or estimated in a two-step procedure. This study applies maximum likelihood estimator. Derivation of the maximum likelihood estimator is as given in Maddala (1983) described as follows;

Let f(ε, u) be the joint density function of ε and u defined by equations(i) and (ii)

According to Maddala (1983), the joint density functions of y_i and I_i is given by the following:

g $(y, I = 1) = \int_{-\infty}^{Zy} f(y - \delta - \beta_i X_i, u)du$ and g$(y, I = 0) = \int_{Zy}^{\infty} f(y - \beta_i X_i, u)du$

Thus, the log likelihood functions for participant i are as follows:

For, $I_i = 1$,

$$ln\Phi\left\{\frac{-\gamma_i Z_i + (y_i - \beta_i X_i)\rho/\sigma}{\sqrt{1-\rho^2}}\right\} - \frac{1}{2}\left(\frac{y_i - \beta_i X_i - \delta}{\sigma}\right)^2 - \ln(2\pi\delta) - - - - - (vii)$$

For $I_i = 0$

$$ln\ \Phi\left\{\frac{-\gamma_i Z_i (y_i - \beta_i X_i)\rho/\sigma}{\sqrt{1-\rho^2}}\right\} - \frac{1}{2}\left(\frac{y_i - \beta_i X_i - \delta}{\sigma}\right)^2 - \ln(2\pi\delta) - - - - - (viii)$$

The outcome variable, upon which assessment of the difference between contract and non-contract farmers is made, is *income.* The variables hypothesised to influence the income are as described in Table4.2.

Thus, in the treatment model, the selection model is entered into the outcome regression equation to discern treatment effect. The actual model estimated is,

$$INCOME = \beta_0 + \beta_1 AGE + \beta_2 EDU + \beta_3 HHSZ + \beta_4 ADULT\_ratio + \beta_5 FSZ + \beta_6 EXPER_{SUN} + \beta_7 NonAgr_{asset} + \beta_8 SAV_{means} + \beta_9 BankAC + \beta_{10} LAND\_endow + \beta_{11} Per\ capita_{land} | + \alpha_1 AGE + \alpha_2 EDU + \alpha_3 HHSZ + \alpha_4 ADULT_{ratio} + \alpha_5 LAND_{endow} + \alpha_6 Per\ capita_{land} + \alpha_7 EXPER_{SUN} + \alpha_8 NonAgr_{asset} + \alpha_9 SAV_{means} + \alpha_{10} BankAC + \alpha_{11} v_1 + \alpha_{12} v2 + \alpha_{13} v3 + \alpha_{14} v4 + \alpha_{15} v5 + \alpha_{16} v6 + \alpha_{17} v7 ----------------------------------- (ix)$$

A dummy for village location is included as a variable to identify selection. Treatment effect models require an exclusion restriction i.e. an explanatory variable that is in the selection model but not in the outcome equation (Khander et al., 2010). Having no exclusion restriction makes treatment effect model very vulnerable to economic misspecifications. It is felt here that village location may influence one's choice regarding joining or not joining contract farming but may not have direct effect on one's income.

Income

In this analysis income refers to net income calculated as the sum of total net incomes obtained from farming and non-farm business. Farm income includes sales less costs from sunflower and the other important crops grown in the area namely, maize, groundnuts and sorghum. Non-farm income includes incomes from small business and wages. The data on income from non-farm activities and business are computed from self-reported data on revenues and the respective costs associated with the activities and business mentioned by farmers.

The focus in the analysis is on the effect of contract farming on per capita household income rather than crop income. This is to take into account the fact that, contract farming draws labour and land away from other activities. Thus, focusing on income from sunflower crop alone may over-state the effects of contracts on household economic well-being and may not objectively depict how well the potential contract

farming system is in influencing the economic well-being of the households, like reducing poverty at household level (Miyata et al., 2009).

Table4.2 describes the variables used in the analysis of outcome (income) equation. The model is estimated using Stata's *treatreg* procedure, where the two components of the model are simultaneously estimated by maximum likelihood estimation (ML).

Table 4.2: Description of variables in the treatment effect model

Variable Category	Variable Name	Parameter	Variable label and Measurement
Income	$INCOME$		Household per capita income in Tshs.
$\boldsymbol{X}\_variables$	AGE	β_1	Age of the household head in (years)
	EDU	β_2	1 for a given education level, 0 otherwise
	$HHSZ$	β_3	Number of Persons in the household
	$ADULT\_ratio$	β_4	Proportion of adults in a household
	$EXPER_{SUN}$	β_5	Experience of growing sunflower in years
	$LAND\_endow$	β_6	Household land endowment
	$Per\ capita_{land}$	β_7	Land per household members(acres)
	$NonAgr_{asset}$	β_8	Non-agricultural values in Tshs
	SAV_{means} dummy	β_9	1 if financial institutions, 0 otherwise; 1 if assets/crops and 0 otherwise.
	$BankAC$ dummy	β_{10}	1 if Yes and 0 otherwise
Participation	$CONTRACT$		1 if a farmer is in contract , 0 otherwise
Z-variables	(1) AGE	α_1	Age of household head in years
	(2)$HHSZ$	α_2	Number of Persons in the household
	(3) $ADULT\_ratio$	α_3	Proportion of adult members to total household size
	(4)EDU	α_4	1 for a given education level,0 otherwise
	(5) $Per\ capita\_land$	α_5	Land per household members(acres)
	(6) $LAND_{endow}$	α_6	Total land owned by a household in acres
	(7)$EXPER_{SUNF}$	α_7	Experience of growing sunflower in years
	(8)$NonAgr_{asset}$	α_8	Non-Agricultural assets owned in Tshs.
	(9)SAV_{means} dummy	α_9	1 if financial institutions, 0 otherwise; 1 if assets/crops and 0 otherwise.
	(10)$BankAC$ dummy	α_{10}	1 if Yes and 0 otherwise
	v_1	α_{11}	1 if village 1 and 0 otherwise
	v_2	α_{12}	1 if village 2 and 0 otherwise
	v_3	α_{13}	1 if village 3 and 0 otherwise
	v_4	α_{14}	1 if village 4 and 0 otherwise
	v_5	α_{15}	1 if village 5 and 0 otherwise
	v_6	α_{16}	1 if village 6 and 0 otherwise
	v_7	α_{17}	1 if village 7 and 0 otherwise
	v_8	α_{18}	1 if village 8 and 0 otherwise

Source: own construction, 2014.

4.4 Results and discussion

The Treatment Effect Model is applied to determine the effect of contract farming on incomes of sunflower farmers taking into account the self-selection problem. The model entails joint estimation of both participation and outcome (income) functions as specified in equation (iv). Using notation from equations(v) and(vi), dependent variable is the household per capita income; independent variables in the outcome equation are the vector of X, and the dependent variable of treatment is I_i in equation(vi), while independent variables in treatment equation is the vector of Z_i in equation(vi). $Z_i$andX_i are the same, and as explained in section 4.3 except that location dummy variable is only included in participation equation to fulfill the identification conditions required in modeling selection (Guo & Fraser, 2015).

The treatment effect model assumes the level of correlation between the two error terms is nonzero, and because violation of that assumption can lead to estimation bias. The parameter *athrho* in the output is related to rho, (ρ), which is the correlation coefficient between the error term ε of the outcome equation(v) and the error termu_i of the selection equation(vi). This statistic is not statistically significant, (the coefficient.141, ($Z = 0.62$), P>|z| = 0.2259) as shown in Table 4.3 (Appendix1). The Wald test (likelihood test) of independence of equations which is a comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed data against the treatment effect model likelihood is given as$H_0: \rho = 0$, chi2(1) = 0.39, Prob > chi2 = 0.53Table 4.3 (Appendix1).

This result implies that the null hypothesis, $H_0: \rho = 0$, cannot be rejected and it can be concluded that ρ is not significantly different from zero. This tells that there is no self-selection bias and therefore, it is not appropriate to estimate the income effect of contract using a treatment effect model that would lead to estimation bias.

Therefore, the Ordinary Least Square Model (OLS) would be appropriate in determining the income effect contract in this study. As can be seen in Table4.4,

other things being equal, contract farmers have a mean per capita income that is15% higher than the mean income of the non-contract farmers and this income difference is positive, although not statistically significant.

Multicollinearity can be a problem in multiple regression analysis like this. Multicollinearity happens when combination of variables makes one or more of the explanatory variables largely or completely redundant. It may cause excessively large coefficients but which are not statistically significant. Diagnostic test for multicollinearity problem was conducted; a variance inflation factor (VIF) was computed to assess the extent to which multicollinearity is a problem for each independent variable. The value of VIF is as presented in Table 4.5. The rule with VIF is, if VIF is more than 10 for any variable a problem of multicollinearity exists (Acock, 2012). None of the variables has a problem basing on criteria of VIF. The mean VIF is 1.21 which is not a problem.

Table 4.3: Ordinary regression results of contract effect on household income

Variable	**Coef**	**Std. Err.**	**Z**	**P>|z|**
Dependent Variable: log *INCOME (Per capita household income)*				
Age of household head (in years)	-.004	.005	-0.91	0.37
SEX of a household head (1 if woman and 0 otherwise)	.015	.133	0.12	0.90
Proportion of adults in the household	.001	.003	0.47	0.64
Education2(1 if primary education, 0 otherwise)	.211	.140	1.51	0.13
Education 3 (1 if secondary education, 0 otherwise)	.541	.367	1.47	0.14
Experience (years growing sunflower)	.041	.026	1.55	0.12
Having a bank account	.311	.287	1.08	0.28
Means of saving2 (1 if a household makes savings by way financial institutions/SACCOS, and 0 otherwise)	.448	.273	1.64	0.10
Means of saving3 (1 if a household makes savings by way of buying assets/crops, and 0 otherwise	.139	.107	1.29	0.19
Log land endowment per household member.	.83	.08	10.04	0.00***
Log Non-agricultural asset value	.02	.01	1.71	0.09*
Contract (contract participation)	.147	.105	1.39	0.16
Constant	9.09	.674	13.47	0.00***
Number of observations = 335				
F(11, 323) = 15.13				
Prob > F = 0.0000				
R-squared = 0.3401				

***, **, and * represent significance at 1%, 5% and 10% levels respectively.

Source: Research data, 2012.

The model moderately explains about 34% of the variations in the income of farmers. This result tallies in terms of the sign of the contract effect coefficient with the earlier finding in the descriptive statistics in which contract farmers are found to have positive and higher per capita income than non-contract farmers. The insignificance of the contract effect on income however, may be reflecting the present weaknesses in contracts noted in the contractual arrangements. As was pointed out in the descriptive analysis (chapter two), current contracts lack premium contract price. The sales price determined by the market (an indicative price) as agreed in contracts between parties are often not sufficiently high to ensure significant increase in sales revenue to recover profitably the cost of production. Usually at the beginning of selling season price is lower due to high supply. Farmers would earn more revenue if they were able to postpone selling until future dates in a season when prices are higher, but this is not feasible among many farmers due to two general reasons. One, there are often pressing problems at household level which requires cash and which cannot be postponed, like buying family food, attending school children and Two, there is generally lack of better storage knowledge and facilities among farmers.

Farmers have to offer their produce at whatever market price prevailing. The price however is low at the beginning and does not match the higher farming expenses and the revenue increase remains insignificant despite the improved yield as revealed in the discussion in chapter 3.

Table 4.4: VIF Test for Multicollinearity

Variable	VIF
Means of saving2 (1 if a household makes savings by way financial institutions/SACCOS, and 0 otherwise)	1.38
edu2(1 if primary education, 0 otherwise)	1.38
Age	1.35
Having a bank account	1.27
edu3(1 if secondary education, 0 otherwise)	1.21
ln Log land endowment per household member	1.21
Proportion of adults in the household	1.18
Log Non-agricultural asset value	1.17
Experience (years growing sunflower)	1.13
Means of saving3 (1 if a household makes savings by way of buying assets/crops, and 0 otherwise	1.11
Sex of a household head (1 if woman and 0 otherwise)	1.10
Contract(contract participation)	1.07
Mean VIF	**1.21**

Source: Research data, 2012.

4.5 Conclusion

As hypothesised in the literature, through contract farming arrangements, farmers can access better inputs like improved seed variety and technical assistances which can help them improve their efficiency, productivity and income from increased volume of production and market access. But as results suggest in this chapter contract farming can be fruitful only if it designed well and can be fully implemented. The estimated treatment effect is an indicator of contract effect net of observed selection bias. The positive but insignificant result may be telling that there can be better outcome of contract farming with regard to income but only if contractual obligations are fulfilled by parties to the contract. Contract market is not fully used in the end of the agricultural season as anticipated; only 28% of contract farmers sell to their contractors. This arise from the fact that contractual market price offered by contracting firms is generally very low and not profitable.

Nevertheless, contract farming can still be considered a feasible solution to problems of production and marketing confronting small scale farmers in Kongwa and the Tanzanian economy in general. It is important however, to ensure that policies are devised which would provide conducive business environment so that firms and farmers are capable of jointly designing better contracts. For example a policy that requires each village or district to have agricultural community development center

well-staffed with qualified personnel in agriculture and related fields would be useful. Such a center would serve to provide technical assistances in contract designing, legal knowledge to famers; it would in a broad perspective serve as a center to promote local economic development where other services such as helping farmers access good loans, helping small firms grow, would be provided. Concrete policies that work would promote contract farming and it would significantly contribute to transformation lives of smallholders.

CHAPTER FIVE

LOCAL OIL PROCESSING FIRMS AND COORDINATION OF SUNFLOWER VALUE CHAIN THROUGH CONTRACT FARMING

5.1 Introduction

Many studies analysing crop value chains tend to focus on upper stream nodes actors, examining for example whether engagement in contract farming has improved efficiency or income of contact farmers. Few studies do analyse the individual capacity and strength of lower steam actors, for example the immediate agro industrial firms which actually provide contract. This chapter presents the findings on the research question number four advanced in chapter one, that, how effective are local sunflower oil processing firms in enhancing coordination of the sunflower value chain through contract farming system? In other words how effective are agro industrial firms in enhancing harmonisation in the value chain by way of contract farming system?

5.2 The role of private sector in sunflower value chain development

Unlike in the period before liberalization of the economy, prior to 1990s when the state controlled almost everything, in current liberalized market environment it is the private sector that takes a centre stage for advancement of any economic sector in Tanzanian economy (IMF, 2009). Thus, the significance of private sector in development of the sunflower sub-sector cannot be over emphasized. There has been growing number of privately owned oil mills crushing sunflower seed in many parts of the country. There are about 47 oil processing mills registered with the Central Zone Sunflower Oil Processing Association (CEZOSOPA) alone. Their growth provides sunflower producers with local market outlets for the crop, and helps ensure the long-run viability of the sunflower enterprise in the region.

This scarcity has motivated some processors to embark on contract farming to promote production of sunflower to ensure that large and steady volumes of quality

sunflower are produced. For a couple of years now, contract farming has been tried in the central agricultural zone of Tanzania, the number of farmers and firms entering into contracts have been on the rise. It is argued that, involvement of private firms (processors) is likely to enhance increased productivity and total volumes of sunflower produced in the area (RLDC, 2009) and improve the overall economic conditions of the small scale farmers.

5.3 The contract farming system: an overview

Contract farming is held to be an essential feature of modern agricultural chains (FAO, 2011; FAO, 2012; UNIDO, 2011). The establishment of contracts between producers and businesses has been found to provide an effective link contributing to the modernization and improvement in functioning of the value chains. Through contracts processors/businesses are ensured with steady supply of right quantity and quality of raw materials from producers, in turn, small-scale farmers are ensured of reliable and profitable market outlet.

Formal contracts specify production and purchasing procedures, as well as credit and pricing mechanisms. Generally producers provide land and labour while buyers provide specialized planting materials such as improved seeds and other production tools. Producers who are often poor small holder farmers gain access to new technology and other inputs which otherwise would be outside their reach (Raynolds, 2002).The popular notion is that both firms and farmers engaged in contract farming inevitably gain equally from the potential benefits associated with contractual arrangements.

However, for a firm to achieve its goal of driving the chain based on its market power, it needs to develop necessary competences, such as competence in technology acquisition, competence in finance, competence in business management and marketing so that it has ability to facilitate activities such as provision of extension services, training, information, and assistance in physical needs such as inputs and other farmers' needs like storage facilities (WEF, 2010).And above all, for it to carry out successfully such all contractual activities, it should be able to develop and

manage strategic relationships with famers so that effective coordination of activities is achievable.

5.4 The theoretical contextual: the value - chain approach

Value-chain coordination by agribusiness firm refers to all strategies which it takes for a firm to ensure that there are value additions in both forward and backward linkages of the chain. Value chain coordination at firm's level binds together different management activities in up and down streams, to bring about inter-company relationships that enable the firm to deliver marketable products, at as less cost as possible. The firm grows competitive and gets larger markets share that can earn it larger profits (UNIDO, 2009). Value chain approach constitutes a way for which smallholders involved can reach not only local markets (firms tied to them) but also national and even international markets (UNIDO, 2009) to which the firms are networked.

The value chain coordination which may take different forms of governance such as, arm's length market relationship, modular, relational, captive and absolutely integrated hierarchies (Gereffi et al., 2005) is gaining popularity worldwide. With the growing globalization of economies, the pre-dominance of spot market with informal rules of conduct for many agricultural products is fading away giving room to more formal and longer relationships between agro-industrial firms and suppliers of agricultural materials through contract farming, which is becoming a popular form of governance in vertical supply chains (Henson & Cranfield, 2009).

Increased adoption of contract farming in value chain management at firm level lies basically with the quest for market options by agribusiness firms. A processing firm can choose to rely on spot market for its supply of raw materials it wants for its manufacturing business. But often in such procurement arrangement the firm does not have absolute control over the quantity and quality of the commodity it wants. And this is often the case in undeveloped product markets of the poor economies,

where farmers are constrained in their production with lack of capital, technology, information etc. (Patrick, 2004).

The alternative can be that a firm produces for itself through vertical integration, where it produces the raw material or commodity it wants using hired labour. But this often turns out to be costly in terms of supervision and it may also be a risk undertaking on the side of the firm. Alternatively as Key and Runsten (1999) observes, most firms choose to adopt contract farming systems a way to overcome such market disarray or failures.

Contract farming is an intermediate production and marketing system which spreads the risk between firms and smallholders. It addresses effectively the issue of transaction costs (Key & Runsten, 1999). It is a value chain management tool which ensures that agricultural production is carried out according to an agreement between a buyer and farmers by establishing conditions for the production and marketing of a farm product or products (FAO, 2012). Through contracts, coordination is implied in better resource allocation and increased productivity of quality products and maintenance of supply with greater efficiency. For a firm, contract arrangement constitutes a valuable way of securing competitive advantage and improvement in organisational performance. Competition in these days is no longer between organizations, but among supply chains (Ilyas, Banwet, & Shankar, 2007).

The non-price factors involved in contracts such as input supply, provision of extension services, advisory services and technical assistances, induce better inputs usage which leads to improvement in efficiency and productivity (Ruben &Saenz, 2008).And through contractual provisions, long term trade relationships between farmers and firms is established such that eventually both firms and farmers can embark on trade relationship relying on strong business principles arising from trust and experience that develop overtime. Through contractual arrangements, agribusiness firms involved gain better control over production, such that consistent quantities and qualities of a product needed is guaranteed.

For farmers, the non-price factors involved in contracts particularly, input provision and technical assistances help them overcome technical and transaction barriers they confront in production. Farmers, who are often poor small holders, are empowered in terms of technical capabilities, in such a way that they are able to increase production acreage, efficiency of production, productivity and quality of the produce. And as a result when contracts are designed with enough incentives, farmers can always willingly choose to offer continued contractual cooperation.

5.5 Review of literature

Since 1980s, the global economic development agenda has tended to push for establishing of free economic market environment in which market forces, rather than states are the major determinant of resource allocation in production and consumption. It has been considered that minimization of government interference in economic affairs and promotion of increased role of private sector, would foster economic growth, and maximizes global welfare. One of the results of this global economic development view has been development of the Value-Chain Approach to Pro-Poor Economic Development (Hawkes & Ruel, 2011).

This is a market-based economic development frame work which presupposes development and welfare of poor people through development of private sector in those activities and sectors having concentration of poor people, such as, agriculture and small scale firms in rural parts in most developing countries (Hawkes & Ruel, 2011). It is argued that under free flow market forces, enterprises in developing countries have to compete with those in developed economies, but given the weak economic background of enterprises in developing countries, they would easily be outcompeted, and hence, would not play their role of facilitating reduction of poverty among the poor.

Thus, the Value-Chain Approach to Pro-Poor Economic Development was developed to encourage participation of the poor, by achieving first the competitiveness of private firms in those sectors involving many poor people and for which they (poor people) have comparative advantages. Poor people need support

from private enterprises in order to effectively participate in the value chains they are engaged and be able to improve or change their role in the existing value chains.

It is further considered that, such an approach would enhance equitable economic growth as the poor engaged would equally find opportunities to generate benefits for themselves just as the enterprises do. This value chain perspective has much of its foundation in the works of Porter (1985), whereby, value chain approach constitutes supply chain management by firms, which is essentially about firm's management of operations in value chains within its borders.

In a more recent value chain literature (Gereffi, 1999; Gereffi et al., 2005) the value chain approach is considered a coordination tool. It creates a governance structure in which coordination of economic activities is made possible through non-market relations and means. The governance structure which may take a form of modular, relational, or captive relationship is fundamentally dynamic and as Gereffi et al. (2005) observe, the value chain governance structure eventually develops into coordination between buyer and seller. The focus is on transformation and transaction processes, taking into account the possibility of quality improvement and optimization of distribution process.

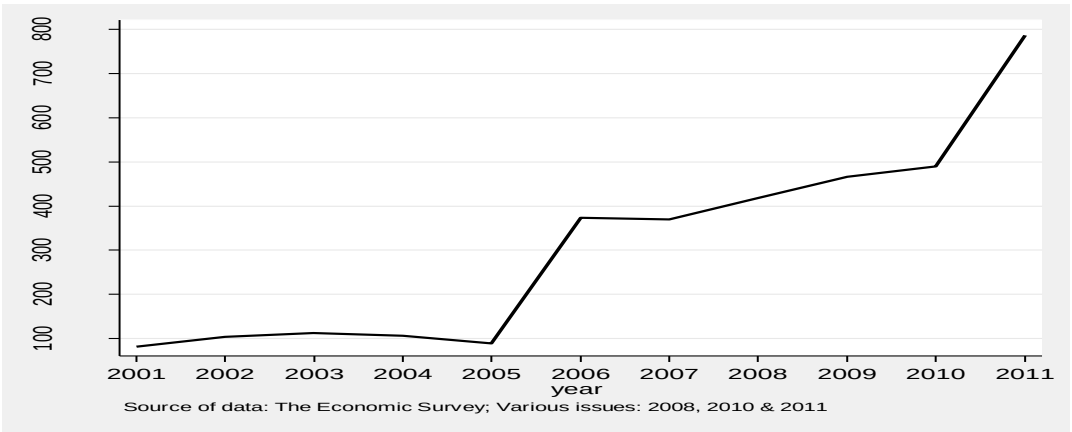
In general terms, value chain development in addition requires concerted efforts involving both private and government parties. Performance of private firms depends on the availability of critical support services such as rural roads, electricity and information services, management support and financial facilities which can best be provided by the government (UNIDO, 2011). Lack or inefficiency in critical support services creates problems in logistics at production and marketing and makes private investment costly. Furthermore, the government needs to create enabling economic environment by setting up policy environment which provide incentives for investors. This includes accessibility to credit facilities at reasonable cost (WEF, 2010).

5.5.1 Sunflower value chain and its dynamics in Tanzania

Sunflower in Tanzania has for a long past only been a traditional crop without any significant commercial value. Of recent however, sunflower is an oilseed crop that is becoming important because of its growing monetary value, associated with its relatively low cost of production. Local demand for sunflower oil, which is cholesterol free is increasing and its potential of becoming a major agricultural commodity for export is also rising, (RLDC, 2008; ARI Ilonga, 2008). Figure5.1 shows that, the total amount produced in Tanzania has steadily increased over time, from an average of 80,000 tons per year in 2000/2001 to about 2,625,000tons per year by 2011/2012 (URT, 2013b), and the crop accounts for about 36 per cent of all oil seeds produced in the country (RLDC, 2008). Other major oil seeds produced in the country include groundnuts, oil palm, simsim and soya (URT, 2008).

The total oilseed that is domestically produced comprise of groundnuts (40%), sunflower (36%), sesame (15%), cotton (8%), and palm oil (1%), (RLDC, 2008).Tanzania still imports edible oil. It is estimated that about 60% of total edible oil consumed in Tanzania is imported, while only 40% is domestically produced (ARI Ilonga, 2008). This suggests that, local producers have a market, at the same time have to face a competition challenge from the imported edible oil.

Figure 5.1: Trend in sunflower production for Tanzania (2001-2011)

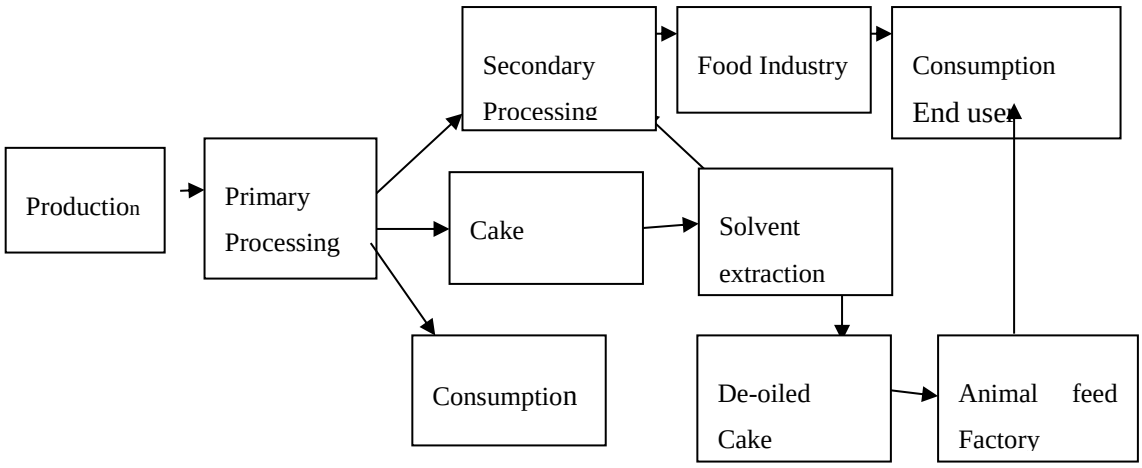


Worldwide, about 95 percent of world sunflower crop is produced in countries of Russia, Ukraine, Argentina, European Union, India, China, and USA; others are Romania, Bulgaria, South Africa, Turkey, and Canada. Only 5%is produced by the rest of the world (URT/FAO, 2008). Traditional large markets for edible oil are in Europe, Middle East, and America. Across the world, demand for edible seed oils is increasingly exceeding supply, and new market opportunities are developing, China and India are the major emerging markets in addition to the existing global markets (KPMG, 2011).

5.5.2 The Input-Output structure of the sunflower value chain

The description of the input-output structure of the sunflower chain in Tanzania depicts six sequential value adding economic activities along the chain, namely production, primary processing, solvent extraction, refinery, food industry and consumption.

Figure 5.2: The Input-Output structure of sunflower value chain in Tanzania



Source: own construction based on Research data, 2013.

Sunflower production is a primary activity, it is predominantly organized on small household holdings ranging between 1 acre and an average of 3.5 acres, employing both, low technology (hand hoe technology) and improved technology involving use of oxen-ploughs and tractors. Production entails farm preparation, sowing, weeding,

harvesting and the marketing of the crop. Seed sunflower is the principal input required; both traditional and improved seed varieties are used in production. Common improved seed varieties used in the area are *Record* and *Jupiter* seeds. The improved seeds have higher germination rate, and high oil content of 40 to 50 percent (compared to local variety which has 25 to 35 percent oil content) (KPMG International, 2011). The better seed improves yields from an average 3 to 15 bags per acre (RLDC, 2008).

Sunflower is harvested within six months, and it is harvested manually. Production ends with cleaning and packing for sale or storage. Thus, in terms of time it takes only 6 months (from production to consumption) to have the final products reaching consumers, a relatively short period of time compared to imported edible oil which takes up to 2 years to reach consumers in the country from countries of origin mainly Indonesia, the Philippines and Brazil (MMML,2010). Furthermore, locally grown sunflower oil seeds are produced without using industrial fertilizers or pesticides, they are organic, and oil produced from them is good for human consumption

Primary processing entails transformation of raw sunflower seed into crude oil by pressing seed to obtain crude oil which is then filtered to make it edible. Primary processing has a by-product, the seed cake that is sold as animal feed. The secondary processing stage involves refining of crude oil into high quality edible oil. Refining process involves neutralizing the oil with alkali, to reduce trans-fatty acids which are viewed as a health risk, they raise cholesterol levels. Refined oil has high nutritional value and provides a healthy option. Mount Meru Miller based in Arusha is currently the only company that possesses a solvent plant. This is the plant which can extract further oil from cakes, usually the waste material in other processing firms. Before Mount Meru Company installed this plant, this advanced level of oil extraction used to be carried out in neighbouring countries. The cake was exported mainly to neighbouring country of Kenya (MMML, 2010). De-oiled cake after solvent extraction process is commonly used in production of animal feed.

Sunflower oil is known for its high content of vitamin E, it also has low in saturated fat (less than10%), and it is high in mono saturated fats which gives healthier life. In food industry sunflower oil is used as a raw material, mostly in bakeries and a wide range of food products including food made by street food vendors, such as *maandazi* and *chapati and* soup. Consumption of oil is largely after primary processing stage, and it is confined to local market due to quality problems. Sunflower oil is consumed as a final product at household level in cooking daily family meals.

5.5.3 The Territorial dimension of the sunflower chain in Tanzania

Sunflower is a hardy crop (that requires little fertilizer), it grows in well-drained loam soils, it is tolerant to low rainfall and suited even to regions with moderate rainfall (Myhew &Penny, 1988). In Tanzania sunflower grows well in many parts of the country, as such, spatial structure of the chain tends to be widely dispersed across a range of localities. Significant amount of sunflower however, is produced in central region of Tanzania comprising three administrative regions of Singida, Dodoma and Manyara, relative to other regions as can be seen in Table 5.1.

Table 5.1: Production of Sunflower from 2000/2001-2004/2005(in, 000 tonnes) in Central Agricultural Zone and other regions of Tanzania

Region	2000/01	20001/02	2002/03	2003/04	2004/05
Dodoma	-	0.6	6.58	34.64	16.66
Singida	25.20	42.50	21.34	72.64	67.00
Manyara	-	-	6.37	12.11	5.01
Morogoro	0.56	0.60	0.13	5.15	2.04
Tabora	-	0.63	0.15	0.74	0.89
Iringa	-	16.30	7.30	63.08	12.21
Shinyanga	7.80	8.80	0.46	2.57	2.84
Mwanza	-	-	0.03	0.07	0.02
Rukwa	32.12	26.18	6.10	49.96	21.01
Ruvuma	-	0.01	0.04	1.54	1.45
Tanga	-	0.01	0.03	0.00	1.82
Arusha	-	7.40	0.44	0.06	0.11
Mara	10.50	-	0.01	0.35	0.19
Kagera	-	-	0.10	0.02	0.02
Kilimanjaro	-	-	3.72	2.80	0.29
Mbeya	4.69	1.42	1.81	1.71	2.75

Source: Ministry of Agriculture Food and Cooperatives, 2008 as adapted in Mpagalile et al. (2008)

The trend has remained the same overtime as indicated in the recent study by TEOSA and Round Table Africa (Table 5.2). Singida region remains the most productive region, and leads in total annual volumes produced with an average annual growth change of 32 % for period running from 2006/07 agricultural season to 2010/2011 season.

Table 5.2: Production of sunflower in selected regions (in tonnes)

	2006/07	2007/08	2008/09	2009/10	2010/11	Average Annual Change in percent
Singida	74,937	128,826	152,500	107,263	165,504	32%
Dodoma	74,860	94,181	88,530	43,621	73,109	9%
Rukwa	36,055	81,436	76,951	73,279	98,673	38%
Iringa	12,722	25,096	47,946	60,921	70,429	58%
Ruvuma	1,800	1,705	1,627	4,682	2,874	35%
Arusha	3,564	2,425	8,368	13,995	13,916	70%
Kagera	61	33	17	6.50	23.50	26%
Tanga	972	942	833	1,052	152	-18%
Morogoro	13,068	14,116	16,322	7,164	18,597	32%
Total	218,039	348,760	393,094	311,984	443,278	38%
Change		**60%**	**13%**	**-21%**	**42%**	

Adapted from TEOSA and Round Table Africa study, 2012 and modified

Under *Kilimo Kwanza* initiative (TNBC, 2009), the crop has been given a priority and made a lead cash crop in the region, the region has promoted wide involvement of private sector actors, where private companies interested in the development of the crop including private sunflower oil processing firms and facilitating companies like RLDC are valued and accorded support they need in their activities. As a result there is an upward leap in overall production in the region.

5.5.4 Spatial structure of value adding activities

There is a large but unorganized population of micro, small and medium expeller oil mills located in sunflower growing areas. Only a few of them are located in rural villages due to limitation of infrastructure especially energy and rural roads. Most of them are located in towns, semi-urban areas and suitable sites for marketing, for example, near to main roads leading to large towns and cities like Dar Es Salaam.

However, there appears to be uneven geographical distribution of higher value adding activities such as solvent extraction and refinery. Despite that the central agricultural zone, comprising administrative regions of Dodoma and Singida is the chief sunflower seed producing area, it has not been able to attract heavy investments in processing activities. There is only one Arusha based company, the Mount Meru Miller Limited which has recently extended its manufacturing activities by opening a branch in Singida. The company holds plans to install an integrated production complex in the area, where all activities comprising seed cleaning, seed crushing, solvent extraction, refining, packaging and marketing will be carried out.

So far, the higher value adding activities have often been located in sites with potential large markets like in cities of Dar-Es Salaam, Arusha and Mwanza, far away from the major sunflower growing areas of Dodoma, Singida and Manyara. The lead companies which have ability to carry out full manufacturing processes to produce top quality end products are Murzah Oil based in Dar Es Salaam and Mount Meru Miller Limited based in Arusha. Mount Meru Miller Limited is currently the only company that carries out solvent extraction (MMML, 2010).

Nevertheless, these large processing firms which locate in major towns but outsourcing raw materials from rural areas have created integrated production, processing and marketing systems that have motivated farmers to engage in more production of sunflower. Improving infrastructure in Tanzania especially the regional road networks is vital. It has enabled economical transportation of raw sunflower to these major towns for processing, making the chain more dynamic.

Sunflower oil that is produced by small local processors is marketed within the local areas. But there is a growing tendency of local traders to seek more profitable markets in distant major urban areas. Refined oil on the other hand, manufactured by processors with advanced technology, is branded and sold to wholesalers, supermarkets and retailers all over the country. A little part of it is exported directly by the refining firms. Mount Meru Miller Company has a status of an export processing unit. Apart from selling on the domestic market, it also exports oil to

European markets. The de-oiled cake which is a by-product of the solvent extraction process is exported to Kenya and South Asian markets (MMML, 2010). Thus, the sunflower chain has near and distant connections.

5.5.5 The sunflower value chain-governance in Tanzania

An examination of the sunflower value chain relations in Tanzania suggests there are at most two relationships that can be distinguished, the dominant one being the market relationships, or Arm's length market relations (Humphrey &Schmitz, 2002). Smallholders can produce the required sunflower which the buyers are willing to buy. Producers and buyers do not develop any close relationship but a market relation. This relationship exists between producers and processors, processors and wholesalers, and wholesalers and retailers.

Where contractual arrangements have been adopted, is probably where one could talk of captive relationship, (Gereffi et al., 2005). There, processors exercise control of some sort on the quality of the sunflower produced, by specifying the type of seed to be sown, they also instruct on best practices in farming sunflower. But, even in these relationships, processors can exercise limited influence in overall production process. Farmers work often on their own, from seed sowing to harvest stage. In general terms, leadership of the sunflower chain is with the two refineries; Mount MeruMillers Limited and Murzah Oil Company, however, the chain is not tightly driven yet, and the level of control that the two refiners exert over other parts of the chain, particularly the upstream is still weak.

Coordination issues;

There is lack of trust between markets players. Producers distrust buyers on the ground that they undermine their well fare through planned low prices they fix for their produce during marketing. Usually, farmers are very much dependent on buyers coming into their villages and cannot ensure that their produce is bought at a fair price. Farmer organisations in addition, are institutionally weak and do not have sufficient capacity to defend interests of farmers against the buyers' interests. Buyers

on their part tend to view small farmers as untrustworthy partners, who are unwilling to adopt modern technologies (e.g. use of better seed varieties), poor in managing of their own investments, and therefore people who are difficult to work with. Processors are therefore often not willing to enter into significant production contracts capable of addressing many of the farmers' problems, because such are said to be associated with high risk.

There is a notable mismatch between supply and capacity. There is huge supply during, and shortly after harvest season, but given the general lack of storage facilities among farmers, they all want to sell all they have produced as soon as possible. This weakens their bargaining power in efforts to obtain better price. Buyers on their part have neither financial capacity to buy enough quantities they would need for a year's long processing at going market price during harvest season, nor warehouse capacity to store that much quantity. This, results from the general lack of long and short-term credits in the sub-sector and generally the agricultural sector in Tanzania. Credits would enable processors to sufficiently invest in expansion and improvement of warehouse facilities and buy enough quantities of raw sunflower.

Moreover, lack of reliable and trustful business relationships between smallholder farmers and processors aggravates the problem of accessing needed quantities of sunflower by the local processors, even where CF is practiced relationship is not reliable, side-selling problem is immense. Clear rules recognized by a third part, like the local government authority (the district council) and a well-defined system of contracting would improve chain coordination and reduce distrust between contracting parties.

5.5.6 The regulatory and legal frame works

A framework regulation for edible oil sector in Tanzania includes strict standards of production overseen by the Tanzania Bureau of Standards (TBS) (URT, 2002) and quality regulation overseen by Tanzania Food and Drugs Authority (TFDA) (URT,

2003a). The policy environment protects local seed and oil production through restriction of oil imports. Since 2010, 10% import duty is imposed on refined and semi-refined imported edible oil while, the government relieves Value Added Tax (VAT) from all agro-processing industry that use 70% or more of their raw materials from local market. In turn, the government requires commitment from agro-processing firms to increase production every year (MMML, 2010).

Tanzania has agricultural and trade policies that support oilseed industry development. The Sustainable Industrial Development Policy focuses on development of agro-processing industries. It is anchored within the national Agricultural Sector Development Strategy (URT/FAO, 2008). The strategy seeks to create an inspiring economic and legal environment in which private sector can thrive. It also seeks to encourage public-private collaboration whereby, the government fulfills its duty of making necessary investments in basic public agricultural services while the farmers make their investments.

The Agricultural Sector Development Strategy (ASDS) enacted in 2001, is further supported by the overall National Strategy for Growth and Reduction of Poverty (NSGRP) which underlines agriculture as backbone of the broad economic development efforts for poverty reduction in the country.

The Tanzania Investment Centre (TIC) is the government agency, whose primary task is to coordinate, encourage, promote and facilitate investment in Tanzania. It advises the government on investment related matters, it also assists private sector in identifying investment sites e.g. land for commercial farming and helps in establishment of enterprises, e.g. incorporation and registration at the Registrar of Companies (URT/FAO, 2008).

There are institutions which play specific roles in the development of the sunflower sub-sector; these include the Tanzania Agricultural Seed Agency (ASA) whose main responsibility is production and supplying of high quality agricultural seeds on sustainable basis. The major functions of this government agency include:

i. To expand seed production and distribution networks so as to facilitate seed accessibility by farmers.
ii. To promote increased private sector participation in the seed industry development through establishment of public-private partnerships or joint ventures in seed production and distribution.
iii. To promote increased demand of certified seed by farmers.
iv. To strengthen research capacities for breeding and producing varieties that address farmers' specific demand (URT, 2003).

Another institution is, the Tanzania Official Seed Certification Institute (TOSCI). This is responsible for seed certification. Moreover, there are also agricultural research institutes like Ilonga and the Sokoine University of Agriculture which breed new and improved seed development. Seed production and certification in Tanzania is governed by the Seed Production Act 2003, amended in 2007 and administered by the Ministry of Agriculture, Food Security, and Cooperatives (RLDC, 2008).

In spite of the agriculture sector being politically declared the core sector for the national economic development efforts, funding for development of key public agricultural services particularly rural transportation and infrastructure has remained low. The poor transport infrastructure in Tanzania increases the cost of transportation all along the sunflower value chain, which in turn, increases the prices of inputs and outputs. This situation strongly reduces the competitiveness of the local sunflower oil against the imported sunflower oil and those other edible oils. Tanzania is also a member state of the East African Community (EAC), as such, it has to observe the several agreements, for example, it has to implement the East African Community Common External Tariff (CET), whereby crude edible oil imports are zero rated. This has impact on edible oil domestic market, in a way that affects local edible oil industry growth.

5.5.7 Actors in the sunflower value chain structure in Tanzania

Chain actors are economic agents who undertake various economic activities and make decisions autonomously; chain actors could consist of physical persons like individual farmers, traders etc., but also legal entities like a business, an authority, a development organization etc., Chain actors are distinguished in literature between those who take an active market position in the chain, and those who support value chain development without actively engaging in business relationships in the chain, described as value chain development support agents (UNIDO, 2009). There are several actors operating in the sunflower value chain in Tanzania, namely producers, primary processors, refineries, food industry and consumers.

The Producers

Producers are mainly smallholder farmers owning small farms with size ranging between one and three and half acres, few own more than three acres. Sunflower production is generally fragmented, involving more than 350,000 smallholder producers national wide (RLDC, 2008). Most sunflower farmers are independent producers, who sell their products individually and have little bargaining power over input suppliers and product markets due to lack of strong formal organization. Sunflower producers lack access to quality and reliable extension services and face limited availability and access to inputs (e.g. better yielding seed and tilling machines) often due to financial constraints. Smallholders have limited access to finance that would enable them invest in productive assets. Private sector role in sunflower sub-sector is still minimal. Smallholders are not an attractive market because of their fragmentation and resulting high costs of distribution that raise retail prices of inputs and financial services (RLDC, 2008).

The Processors

There are small and medium scale primary processors. Small processors are those with small oil mills capable of crushing 30 to 50 bags a day, while medium scale mills are those that can crush about 150 to 200 bags per day, (RLDC, 2008). Generally, there are a growing number of small and medium processing firms all over the country as sunflower production spreads across regions, increasingly providing more market opportunities to smallholder farmers. Processors prefer yields from improved or hybrid seed to yields from local seed breed because of the higher oil content. Processors are generally willing to pay higher prices for quality produce.

There are currently only two large processors who have refinery plants in the country, the Murzah Oil Industries based in Dar Es Salaam and Mount Meru Millers based in the northern town of Arusha. These carry out both seed crushing and refining processes of sunflower oil (ie they carry out a complete manufacturing process).

Refineries have under-utilized capacity of refining due to shortage of raw sunflower, and struggle hard to purchase sufficient qualities during harvest season (RLDC, 2008). *Bakery* and *confectionery* are the main commercial users of sunflower oil, it is also used in food products made by street food vendors such as *mandazi* and *chapatti* and soup and other fried food for sale. Other but still minor industrial uses include, use in manufacturing of soap, detergents, insecticides and paints. The final actors in the sunflower value chain are *consumers* who are mostly the local population. Consumption is still largely confined to local market due to quality problems.

5.5.8 The value chain development support agents

These are non-chain actors; they are intermediaries who facilitate chain processes by providing support in such things like organizational and technological skills, but also training and assistance in building collaboration between public and private sectors (Trienekens, 2011). Non-chain actors include the government, whose role is considered critical for any meaningful agricultural development. The government

needs to play a strong leadership role by investing in development of basic infrastructure such as roads, electricity, rail, ports, storage and telecommunications to connect interdependent components of the economy. Good infrastructure creates logistical efficiencies at every stage of commodity chain development (WEF, 2010).

Both central and local government authorities (LGAs) have a role in development of the sunflower value chain; however a significant role in facilitating development in sunflower sub-sector has been played largely by private companies and NGOs. The most important supporters have been;

Rural Livelihood Development Company (RLDC)

This is a non-profit organization funded by Swiss Agency for Development and Cooperation (RLDC, 2012). It started its operations in 2005. Its main geographical area of operations has primarily been the central agricultural zone of Tanzania, the most productive area for sunflower in Tanzania which comprises three administrative regions of Dodoma, Singida and Manyara. It has over time however, extended its presence to other regions like the lake zone covering administrative regions of Mwanza, Shinyanga and Mara where the company has been involved in other agricultural activities like dairy, poultry and cotton production.

The main activities performed by the company in sunflower sub- sector (RLDC, 2012; RLDC, 2010), can be summed as follows;

vii. To work in partnership with other stake holders of the sector to address the production and marketing constraints facing sunflower farmers and processors. The company has developed a broad array of stakeholders including the local government authorities (LGAs), business, banks and farmers' organization and they jointly worked to improve sunflower business environment.

viii. To give temporary support with sustainable impact e.g. by subsidizing market function such as inputs and service, when it is clear who will pay for them after the project ends.

ix. Strengthening advocacy for business environment improvement by

supporting lobbying and advocacy activities of sector associations such as Tanzania Sunflower Processors Association (TASUPA), Tanzania Edible Oil Actors Association (TEOSA), and the Central Zone Sunflower Oil Processing Association (CEZOSOPA).

x. To facilitate alliance formation between farmers, processors and other stakeholders who may be interested in the sector development.

xi. To propose convincing business model of development such as contract farming system, local seed multiplication projects to improve seeds availability at farm level and enhance production and productivity of sunflower.

xii. To facilitate oil processors (through their association CEZOSOPA) in improvement of quality, volume and marketing of sunflower products (RLDC, 2012; RLDC, 2010).

RLDC has been an important sector change agent through its facilitation activities and some positive effects on both production and marketing are recorded.

Stichting Nederlandse Vrijwilligers **(SNV)**

This is a Netherlands Development Organization (Stichting Nederlandse Vrijwilligers). It has worked in the sector since 2005 (SNV, 2010). Its primary focus was on facilitating establishment of edible oilseeds multi-stakeholders forum so that actors in sunflower chain in particular farmers and processors have a platform to engage each other, and also other stakeholders for development of the edible oil sector in the country. In 2006 SNV facilitated establishment of the first Oilseed Multi-stakeholders Forum (OMF) based in Dodoma. In 2007 as the result of the first forum reflection an association of sunflower oil processors in the central zone of Tanzania (CEZOSOPA) was established as an off shoot of the forum, and later the similar association of edible oil processor in Manyara was UMAMBE[15] was formed.

[15]*Umoja wa wasindikaji wa mbegu za mafuta Manyara*

In 2008 with the help SNV an apex association, the Tanzania edible oilseeds actors association (TEOSA) was formed its main objective stated as, 'enhancing competitiveness of local seed oil on domestic and regional markets'(SNV,2010). In 2009 SNV in collaboration with Singida Municipality and one private processing firm Songela Investment Company attempted sensitizing small scale farmers for adoption of contract farming in Singida region. In 2010, SNV in collaboration with another NGO, VECO-Tanzania (a Belgian NGO) concentrated on formation of farmers groups in Chunya District in Mbeya whereby 55 groups representing 2500 farmers were formed (SNV, 2010). In summary SNV has been instrumental in development of the sector by facilitating of establishment of necessary associations which help various actors get organized and coordinated for further development of the sector.

Tanzania Edible Oilseeds Actors Association (TEOSA)

This is an apex association of edible oil actors in the country. It has the primary responsibility of promoting and protecting interests of the edible oil industry in the country. It includes producers, of oilseeds, processors, traders and suppliers of technology.

The main functions of TEOSA (TEOSA &Round Table Africa, 2012) are as follows;

i. To engage in lobbying and advocacy for the interests of the industry.
ii. To strengthen service delivery to edible oil value chain actors.
iii. To develop knowledge and skill capacity to manage and share knowledge.
iv. To carry out research on production and marketing.
v. To facilitate access to financial services.
vi. To engage in cross- cutting issues like HIV/Aids in relation to the industry.

TEOSA works with other actors such as BEST-AC, Round Table Africa and SNV and local government authorities to enhance edible oil development chain (TEOSA &Round Table Africa, 2012).

Tanzania Sunflower Processors Association (TASUPA**)**

Tanzania Sunflower Processors Association, this is the recently formed apex association of sunflower processors in the country. Unlike TEOSA this is for sunflower oil processors only. It is based in Dodoma town. The main objective of the association is to link and coordinate sunflower oil seed processors wherever they are in the country. It works to facilitate processors so that they produce high quality edible oils meeting both national and international standards (TASUPA, 2013).

Seed breeders

Sunflower producers are increasingly relying on use of better seed variety (records, Jupiter and Kenya fedha) to augment their production. Tanzania has formal seed system whose components include breeding of improved seed varieties, seed production, processing, certification and distribution. Initially the government was the only legal actor in production and distribution of seeds through its state company, the Tanzania Seed Company Limited (TANSEED), and the mandates of promoting the use of improved seeds was assigned to Agricultural Seed Agencies (ASA).

However, following growing liberalization of agricultural markets, production and distribution of seeds is largely becoming a responsibility of private entrepreneurs though, under the auspices of ASA and the Tanzania Official Seed Certification Institute (TOSCI) which regulates the seeds business in accordance with the Seed Act No 18 of 2003 (Mizambwa, 2012). In overall however, the availability of quality seed in total is still low. It is estimated that only about23.3% of the actual demand is domestically satisfied. 16% is covered by imports and the remaining portion is completely not satisfied (ESAFF, 2013). Seed availability is even lower for sunflower.

Major producers of seed sunflower are, TANSEED, ASA and Ilonga Agricultural Institute. There are many other private seed breeders based in different parts of the country such as Arusha and Mbeya. Seed Sunflower available to farmers in the central agricultural zone of Tanzania is mainly supplied by ASA based in Morogoro.

Currently there are also two companies based in Dodoma which produce seed sunflower, the Highland seed growers with breeding farm in Mchito village in Chamwino District and Strad Company Limited with breeding farms at Zamahelo in Bahi District.

Despite the existence of formal seed system in the country, still the availability and accessibility to improved seed sunflower by farmers is limited, and far less than the demand. There are several explanations for this; for a long time in the past sunflower was generally not considered to be an important crop, be it for consumption or commercial purposes. In fact, with the exception of maize, the demand for seed of other crops including sunflower has been little, as the result, there have been no big private companies (local or international) interested or attracted in seed production business for such crops, this explains why some crops including sunflower lack a formal system to ensure adequate availability of seed even today.

There are small local companies which try to exploit this emerging business opportunity of producing seeds, but many of them face the problem of inadequate capital, their capacities to produce seeds massively remain limited (Mizambwa, 2012), but, they also find market problems on account of excessive production costs involved. Many small scale farmers scattered all over the rural areas have low purchasing power, even when the better seed varieties are made available, only a few of them can afford buying sufficient quantity with their own finance.

In attempts to address this problem of costly seed, the Ministry of Agriculture Food Security and Cooperatives has worked to promote use of Quality Declared Seeds (QDS). These are seeds which are locally produced by farmers themselves in their locality under seed multiplication projects. Best seeds (*certified one)* from ASA are used as foundation seeds and multiplied to produce Quality Declared Seeds (QDS) under special conditions guided and monitored by the local extension personnel, often from the District Agricultural and Livestock Department Office (DALDO). Availability of improved seeds, the QDS increases the chances for many farmers using improved seeds. The QDS are relatively cheaper than the official certified one

seeds from seed agricultural agency. Yet, even with this seed multiplication projects, quality seed varieties are not sufficiently available for all farmers in villages.

The role of private sector in general, in agricultural value chains development in Tanzania

The private sector in Tanzania is generally still young on account of the country history where, in the past, the state dominated the economy. However, the growing significance of the sector in the country is reflected in the greater role currently assigned to it in designing and implementation of national level development projects, in particular those targeting agricultural development projects. In the current agricultural development initiative, *Kilimo kwanza*, the private sector is mandated to be the lead implementing agent, and is set to be the engine of economic growth (URT,2012).

The evolving contract farming system in Tanzania is partly a result of the *Kilimo kwanza* push. The *Kilimo kwanza* initiative in its pillar 4.7 underlines the need to fast truck contract farming system registration and carry out capacity building measures for the parties involved in contract farming, the private sector and, smallholders and their associations (TNBC, 2009)

The sunflower chain depicts changing dynamics; however, there are still a number of bottlenecks in between its chain nodes. There are constraints in both production and marketing resulting from inadequate investment in the sector. This calls for private-public alliances in building of a more enabling economic environment, in which both public and private sectors and non-chain facilitators can effectively play their roles. CF is a private institutional arrangement that could be promoted to address some of the persisting problems.

5.6 Approach to analysis

As stated earlier in the methodology section in the introductory chapter, data collected from value chain survey were analysed using value chain analysis

framework, based on industry structure analysis proposed by Porter (1985). This is an analytic framework by which information gathered about a firm is organised and analysed based on considerations such as ability of the firm to control its supply and demand chain, ability to control three forms of competition; competition against its rivals, that is if a firm can control competition from its rival arising from higher technology and economies of scale; competition against new entrants, that is if a firm can constrain its price to competitive level; and competition from substitutes. Qualitative analysis techniques were used in particular the content analysis, where relevant information from the interviews conducted was extracted, organised and analysed in relation to the research objective.

5.7 Findings and Discussions

5.7.1 Characteristics of local oil processing firms

Table5.3 shows that all local oil processing firms are family run businesses and as per national definition of small business (URT, 2002), these firms fall under small enterprise category. These are small enterprises on account of the number of workers they can employ. They all have a number of workers that is less than 50.

Considering the ages of firms in business, Table5.3 indicates that there is continuous in-flow of new entrants into the sub sector; most firms are less than ten years in business, and this is in line with the fact that, sunflower sub-sector in Tanzania is relatively a new sector that is undergoing gradual but significant commercialization.

Table 5.3: Characteristic of local sunflower oil processing firms

Codes	Firm (A)	Firm(B)	Firm (C)	Firm (D)	Firm (E)	Firm (F)	Firm (G)
Ownership							
of firm	Family	Family	Family	Family	Family	Family	Family
Age of Firm in Years	6	3	5	10	13	5	8
Workers							
Permanent	8	9	8	4	33	11	6
Temporary	-	-	-	12	-	-	-
Procurement							
channels	100%	95%	80%	69%	5%	0%	15%
Contract	0%	5%	20%	31%	95%	100%	85%
Spot-Market							
Months worked							
per Year	10	4	10	6	10	8	7

Source: Research data, 2013.

Sunflower is increasingly gaining status of a significant cash earning crop especially in the central agricultural zone of Tanzania, and there are many business opportunities unfolding related to the sector such as edible oil manufacturing business. Table 5.3 further indicates that none of the firms surveyed is able to operate for all months in a year.

Most firms can operate only for some months in a year, and thereafter stopping manufacturing process. The average time of operation is currently at 8 months implying, there is on average about four months for which plants remain idle in annual working time. When processors were asked for the reasons for these processing disruptions, the most common responses were, inadequate supply of raw materials due to low total production of seed (low supply), and limited working capital. Processors cannot obtain sufficient quantity of raw materials they need for continued processing due to low supply of the raw material. But, even in areas where local production is substantial enough to support prolonged availability of seed, some firms cannot buy enough stock for all year round processing due to lack of sufficient working capital. This later aspect is the experience of firm A, in Iramba district, where recorded break downs in production process are not due to lack of raw seed, but due to lack of enough fund to buy a year's supply. The quantity of total

sunflower produced by contract farmers in the area is more than what the firm can absorb in a batch or few batches of procurement.

Interruptions in processing for whatever reasons indicate that, there exists in the sub-sector inefficiencies related to plant operations. There is, as the result, resource waste experienced in terms of machinery decay when they remain idle, and wastage of time, a valuable resource for growth and development as well.

5.7.2 Coordination of the supply chain

The common and major problem facing oil processing firms is lack of adequate supply of quality oil seed to enable optimal and continuous processing all year round. To overcome this problem firms attempted to set up contract farming system in order to organize production such that large and steady quantity of quality seed is secured.

As shown in Table5.3, most firms rely on both channels in collection of raw materials, spot market purchases, and contract supplies. Interviews with processors confirmed that driving force behind setting contract farming strategy is mainly the need to have consistent supply of standard quality sunflower output. As argued in the literature in chapter two, contract farming system has so many advantages, among them, that of ensuring coordinated actions. Contracts can positively influence production and productivity through contractual arrangements that ensure timely availability and delivery of production inputs such as seed, and market outlet for the produce. Thus, by setting up contracts, firms improve coordination of production. They can ensure themselves with consistent supply of quality raw materials and avoid breakdowns in oil manufacturing process.

But, as it can be deduced from Table 5.3, firms involved in contract farming depict mixed-record performance of contracts. Some firms can be considered as being successful in their contract farming scheme by evaluating the percentage by which they have been able to secure raw material supply by way of contracts. Firms A and B can secure 100% and 95% respectively of their total raw material supply needs from their contractual arrangements, while firm B, C and D can only secure small

part of the quantities they need. Firms G and E indicate weak contracts expressed by low contributions at 5% and 15% respectively to total raw material gained from contract arrangements. Firm F indicates a failed contract scheme gaining 0% from its contracts. It appears that for a firm, mere having contract arrangements in place does not guarantee certainty of material supply sufficiency. This situation implies that contracts work, but subject to some other factors. The issue of interest then, is why some firms have successful contracts while others have weak or failed contracts. Further discussion of this issue is carried out in the following sections.

Description of contracts

Contracts practiced by all firms bear some similarities, but also some differences. Similarities are in many ways. First, all contracts are only one year or one crop season contracts, renewable. Famers self-select into the available contracts. All forms of contracts are based on a contract farming model facilitated by RLDC. The concern of contracts is provision of inputs, in particular seed. Seed provision intents to ensure that famers use quality seed, so that they produce quality output in increased quantities. Additionally, to ensure a large quantity of output is obtained firms try to promote participation of more farmers in the scheme. The number of small-scale farmers involved varies from one firm to another. Some firms contract as many as 3000 farmers in single season in an area comprising up to25 villages. With facilitation from RLDC, two firms B and C were able to recruit 3000 farmers each in 25 villages of Mpwapwa and Kondoa districts respectively as indicated in Table 5.4.

Seed provision constitutes an important aspect of the existing contracts and is implemented by all contracting firms as indicated in Table5.4. Other services like, traction services are rarely provided to farmers, only firm C provided the service, but, to a very few farmers who were identified as being too poor to afford buying tractor service on their own. The cost for traction of one acre was at a fixed rate of Tshs 25000/-, a farmer had to pay back after harvest in terms of harvest produce. There are no agreements on such other inputs like fertilizers, pesticides which may be required to enhance farmers' productivity. Despite this situation, farmers can still

grow well sunflower in this part of the country without requiring varieties of other inputs apart from seed. This suggests that soil fertility and other environment conditions are still basically supportive of crop production, but this situation may not remain the same in the future. It was revealed during discussion with the chairperson of TASUPA, who is also the owner of contracting firm, that, in places like Mpwapwa, there is growing prevalence of pests (cutting worms, elegant grasshopper, and birds) and diseases which in the near future will require increased application of pesticides.

Contracts across all farmers are informal in the sense that, they are designed and implemented without following strict legal procedures. Their implementation relies very much on personal relationships between a firm owner and farmers. Trust is the major factor driving compliance. The current contracts are technically one sided type of contracts because of excessive dominance of contracting companies in processes, particularly in contract designing.

Unlike most of the standard farming contracts, during actual drawing of contractual agreements, these contracts do not provide for forward pricing. Price is left to be determined by the market. Farmers are exposed to written copies of contracts only once during the initial negotiations at the beginning of the farming season and they are not left with any copy after agreement except papers where they signed to acknowledge receipt of inputs supplied.

Notable differences in types of contracts practised are mainly in the way seeds are distributed. Some firms distribute seed to their farmers on credit at retail price, while others distribute on both cash (often at below retail price) and credit basis. Firm F is the only firm which distributed seed on credit. Three firms C, D, and E charged the base market price[16] for the seed they distributed purchased from seed producing agency (ASA). Firms A and B had own seed multiplication projects in which produced seed was sold to their farmers at a considerably low price as will be

[16]A price charged at the seed research centre by agricultural seed agency

demonstrated in the following section. The choice of which modality to be used in seed distribution depended on firm's own assessment of the level of trust between it and its farmers.

Interviews with managers of the firms revealed that, there was a high risk associated with distributing seed on credit resulting from side selling problem, which is a common problem to all firms as indicated in Table 5.4. It was possible to distribute seed on credit and getting in return little or no output at all delivered to the company after harvest. The intensity of side-selling problem differs from one firm to the other. Where the problem is acute, is where the firms distribute seed on cash. Two firms E and D operating in Kongwa District have experienced severely this problem of side selling, for now, they no longer deliver seed on credit. Thus, while distribution of seed on credit intended to enable farmers' access quality seed to expand and improve their production despite their liquidity constraints, distribution on cash was on the other hand a way to facilitate availability of seed to farmers in a manner that minimizes risk.

Comparison of successful and failed cases of contracts

Although contracts have some similarities and little differences as explained above, the overall outcomes are profoundly different, with some of them recording success while other record unsatisfactory results. In this section, factors that could be attributed to differences in contract performance between the two groups of firms are identified and discussed.

Better performing firms, firms; A, B, C and D as can be seen in Table5.4 are similar to other firms in terms of what they provide to farmers in contract, and the general contract agreement conditions. They all provide quality seeds, facilitate extension services, and provide tools for harvesting, such as seed cleaners and canvases to help farmers maintain clean and quality produce. Thus, variations in performance of contracts seem to be related to some strategic practices which are specific, undertaken by these firms on individual initiative basis.

These interventions are external to contracts, but have demonstrated to have significant impact on performance of contractual agreement. Such strategic activities include local seed multiplication and distribution projects, use of demonstration plots and use of mobile phone text massages for communication on important issues related to production of the crop. Collaboration with the local government authorities (LGAs) and perhaps also, increased involvement of female farmers, as is the case with firms A and C as summarized in Table 5.4. These seem to be important and decisive factors for success or failure in performance of contracts. Their effects are described and examined as follows;

Seed multiplication

The problem of low availability of improved seeds has always been a farmers' great concern. Poor quality seed are a major cause of low productivity and low income from sunflower farming business among smallholder farmers across area. Successful contracting firms are those which have managed to provide solution to this basic farmers' problem, by devising own ways of having seed multiplied and distributed locally in the manner that is easy and cost effective.

Firms A and B for instance, in partnership with RLDC and their respective district authorities of Iramba and Mpwapwa, managed to mobilize resources and farmers to undertake own local production of improved seed. This improved sunflower seed is multiplied from the top quality seed '*certified one'* purchased from the national Agricultural Seed Agency (ASA). Improved seed has higher germination rate, and high oil content of 40 percent compared to local seed believed to have between 25 to 35 percent oil content. After thorough inspection by Official Seed Certification Institute (TOSCI), the seed sunflower locally produced is declared as quality seed (QDS) and released for distribution to famers.

This QDS is distributed to farmers at price that is half the price of the seeds from ASA or agricultural research centre sold by stockists. The net results of this successful intervention in easing the problem of low seed availability have been

mainly two. One, farmers involved in seed multiplication activity are benefiting directly from farm gate income, whereby, one bag of quality seed earns a farmer average revenue of Tshs 105,000[17]per bag, a far higher revenue compared to normal mean revenue of Tshs 35,000 earned per one bag of normal sunflower produce. Two, local production of seed sunflower has boosted the overall accessibility to seed input. Farmers can obtain sufficient seed of acceptable quality at a reasonable price of Tshs 1500 per Kg as opposed to the expensive seed, 'certified one' obtainable from the National Seeds Agency(ASA) at Tshs 3500 per Kg.

In response to this situation, many farmers have joined contract scheme to produce sunflower. Yield has more than doubled from a low yield of 3 to 8-10 bags on average per acre. In addition, the quality of the yield and the overall volume of quality produce in the area have increased, thus, explaining the success of the contract schemes for firms A and B.

Use of Farmer Field Schools (FFS)

Another pronounced problem constraining sunflower farming is lack of skills on proper crop husbandry among farmers. Demonstration plots offer solution to this problem. They provide opportunities for the farmers to learn by seeing the right practices in farming sunflower, and there after replicating the same on their own farms in right time. In all places where demonstration plots are used, farmers have gained improved agricultural skills, which have enabled them increase productivity and the overall total output.

Both firms B and C, in additions to other provisions they make to farmers, they count this approach of using demonstration plots to be the most important factor explaining the significant difference performance of their contracts. Demonstration plots are useful in that, they enable a farmer to emulate what is done and how is it done: for

[17]A kilogram of QDS cost 1500Tshs per Kg. A bag, usually of 70 Kgs earns a farmer 1500*70= Tshs 105000. While Kilo of sunflower produced at harvest time is Tshs 500T, a bag of 70Kgs earns a farmer only 500*70=35000Tshs. (computed using field data)

example, farmers are shown how to maximize use of farmed land by planting in line at recommended intervals (of 75cm between pits and 30cm apart with 5cm deep) instead of traditional method of just throwing seeds in the field. Farmers optimise use of their farm land and other inputs like seed. For example, only 3-4 Kilograms of seed are used for one acre and the returns per acre are quite high.

Table 5.4: Chain processes and contractual arrangement

Chain Processes	**Firm A**	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**	**Firm G**
Procurement							
By Contracts	100 %	95%	80%	69%	5%	0%	15%
Spot- markets	0%	5%	20%	31%	95%	100%	85%
Inputs provided							
Seeds	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Extension service	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Information	Yes	Yes	Yes	Yes	Yes	No	Yes
Traction service	No	No	Yes	No	No	No	Yes
Price	Mark	Market	Market	Market	Market	Market	Market
Assistance from RLDC							
Financial	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Technical	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Collabo with LGA	Yes	Yes	Yes	Yes	Non	No	No
Prod. Strategies							
Seed Multiplication	Yes	No	Yes	No	No	No	No
F. F. *School*	No	Yes	Yes	No	No	No	No
Use of SMS	Yes	No	No	No	No	No	No
Warehouse	No	No	No	Yes	No	No	No
Tools (canvas)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Farmers contracted	Over 800	3000	3000	Over 500	Over 600	-	2450
Female farmers representation	Over 63%	49%	Over 70%	Not specified	Not specified	Not specified	Not specified
Problems of CF.	Yes				No		
Limited capital		Yes	Yes	Yes		No	No
Side-selling	No	Yes	Yes	Yes	Yes	Yes	Yes

Source: Research data, 2013

Given the low level of education generally characterising rural population, practical training on demonstration plots appears to be quite ideal in imparting necessary knowledge and skills pertaining to sunflower production.

Support from Local Government Authorities (LGAs)

Two firms A and B appreciate the role of the local government (the district council) and consider it to be an important factor for their successful contract farming projects. The type of support given can be divided into two categories. Support in sensitization of farmers where village leaders in particular, are actively engaged in mobilizing people for sensitization meeting held in villages between contracting firms and villagers. Such efforts influence positively villagers' choices of participation into contracts. In the second category, the local government at district level (the higher LGAs), support private projects in terms of provision of extension services and personnel.

In Iramba and Mpwapwa districts where firm A and B operate respectively, extension officers from the district agricultural development office were assigned to instruct and monitor processes of seed multiplication projects to obtain quality seeds. These services, which otherwise would be an expensive responsibility of the contracting firms, were offered at the government expenses. This was a boost for the firms' projects of running contract farming. The positive response from village and district authorities, significantly contributed to development of high community good will of farmers towards the firms working in their areas. Seeing their leaders collaborating with the firms, farmers trusted the companies and loyalty was gained.

This partly explains why defaults or side selling was not a problem with firm A, and was not a big problem with firm B and firm C as compared to rest of the firms whose defaulting rate threatened survival and sustainability of contracts. Owners of firms A, B acknowledged they immensely benefited from collaboration with district and village authorities. The success stories of their contract farming projects were partly explained by that fact. It looks like the government support is a crucial factor for success of contract farming projects.

Greater women representation in contracts

Managers of firms A and C had the view that their successful contracts were partly due to inclusion of more women farmers in their contracts. From separate interviews

with each manager, it was found to be the common argument of both that, women are honest and often committed to terms of contract. They do not cheat or abuse the terms of contract, and they tend perform industriously to reach their set goals. However, caution should be exercised in interpretation of this finding. This caution arises from the fact that, the managers of these firms are themselves women. It is hard to tell with certainty whether inclusion of more women farmers was an objective choice or just a convenient choice with bias because they are women themselves and therefore preferred working with their fellow women. The revelation however, points out to the fact that, gender aspects probably need to be considered in contract formulation and implementation. This outcome suggests that, women constitute untapped resource that may exceptionally be a defining factor in performance of contract farming if explored.

This outcome conforms to what Raynolds (2002) observes in production relations in contract farming in Dominican Republic. And it is against the literature which gives the impression that women are subjects of men, especially in African culture and that they are incapable of undertaking decisions in matters concerning the household, such as signing for contract farming. It is assumed a woman cannot mobilise the labour of a husband, and a husband would at any time interfere for his interests if a woman took charge of signing the contract (D`Sliva et al., 2009). But this study in this chapter has shown that greater inclusion of women in contracts can contribute significantly to increased performance of contract.

Greater inclusion of women believed to be honest participants in contract farming has enabled the firm avoid side selling problem, a problem that has widely faced all other firms; at 63% and 70% engagement of women in contract farming, firms A and C enjoy a high degree of business reliability manifested in absence of side selling problem. Transaction costs related to open market purchases are avoided as shown in Table 5.4 dependence level on spot market of the two firms at 0% and 5% is quite very low.

Use of mobile phone revolution

This is an invention of only firm A. In partnership with companies providing mobile phone services in the country; *Vodacom-Tanzania*, *Tigo* and *Airtel*, the firm has established a system where all its farmers are simultaneously reached through their mobile phones and instructed or reminded by means of short text messages on for example; starting time of certain farm activity such as planting, weeding etc., according to the season or stage of plant development.

Use of short massages has been useful tool for firm A, in coordinating production of sunflower farmers. And this has been an exploitation of the expanding government scheme of taking telecommunication services to rural areas and the remotest parts of the country. With this approach, firm A has been able to effectively influence farming behaviour of the farmers by ensuring timely coaching on sunflower agronomics in the area. Twice in a farming season, the firm provides training and advice on both proper crop husbandry (in November), and proper post-harvest management of the produce (in May). The net result of this has been higher performance of contracts.

Firm A has improved sunflower farming practice such that it obtains all of its raw seed supply from its famers. The delivery is 100%.This is the highest rate when compared to other firms as can be seen in Table 5.4.

Contractual bottlenecks

Managers of those firms which did not perform well, firms E and G, and a firm whose contracts completely failed, firm F, identify and mention several problems, the major ones being side selling and scarcity of resources, explained as follows;

Side-selling or breaching of contractual obligations by farmers

This is the most pressing problem. All except firm A as indicated in Table 5.4 admit that this is a critical issue in managing contracts. The factors contributing to side selling seem to be related to how contracts are agreed on issues of mutual interest

like price. The current contracts practiced are different from standard contracts in that, they do not spell out contract price.

Price is left to be determined by the market when selling season begins. In effect this contract arrangement appears to encourage opportunistic behaviour/side selling among farmers. There are many buyers including those who do not have any previous agreement with farmers who flock into the villages to buy sunflower produce on cash. This situation leads to sudden increase in procurement competition, and price usually jumps high, tempting farmers to dishonour their contracts.

Firm G for instance, could not buy much from her contract farmers in Bahi District during the 2012/2013 harvest season because of unexpected rapid price rise. Competition had intensified drawing in big edible oil companies like Murzah oil company from Dar Es Salaam whose raised price offer at Tshs 55000 per bag against the normal spot market price at Tshs 40000/-,crowded out most local buyers including the contracting firm. **S**imilarly, in Kongwa District, firms D and E experienced stiff competition from free traders coming from Kibaigwa as well as those coming from as far as Dar Es Salaam.

Firm H could not buy anything from its farmers due to sudden disagreement which occurred over the interpretation of the clause 'market price' agreed previously. The 'market price' agreed in contract was interpreted by farmers as market price in Dodoma town, not the price in the villages in Bahi[18] District[19].

Contractual setting in which agreements are made based on terms of exchange which exclude price, appear to accommodate an in-built potential source of contractual problem of side selling. Price offered by contracting firms at the beginning of the

[18]Bahi District was formerly a part of current Dodoma town before new demarcation in 2007. It is thus a nearby rural district

[19]There is usually a price difference between purchase made in villages and those made in urban areas. It costs about 32000 Tshs per bag of sunflower seeds during pick harvest season in villages while the same bag costs 35000Tshs in town. Buyers keep village price a bit low to compensate for costs of transport and stay they incur while collecting seeds in the villages, and that is known to all parties.

selling season which is an indicative price is often very low. Although it is set as mechanism to prevent lower price, farmers do not find it matching the actual farming expenses. Furthermore, sunflower price does not have tendency of falling at any time in a season, but it is usually lower at the beginning of the season due to high supply. Thus, independent traders who flock into the villages buying directly on cash from farmers intensify competition and provide an opportunity for farmers to maximize their sunflower farm revenue through increases price even if a small increase, hence side-selling.

This situation on the other hand is a result, as claimed by owners of contracting firms, of unfriendly business environment currently prevailing in the sub-sector. Contracting firms have not yet been able to influence the exciting legal environment. Farmers on their side attribute the situation to poor commitment of contracting firms to their contractual obligations e.g. of supplying adequately the inputs pledged under contract. Contracting firms lack right attitude, preferring instead reaping more than what they have sown. Farmers as independent economic agents remain entitled to freedom of choosing whom to sell to, their produce once they have harvested. This is always derived by profit maximisation motive.

Lack of specific legislations to support CF is mentioned by contracting firms' owners as the reason why trust cannot be of high level during operationalization of contracts. Farmers mention the same reason as the main cause of poor commitment of firms and that largely explains why farmers cannot trust the firms much. Table 5.5 summarizes challenging issues related to practice of contracts pertaining to supply chain. From the Table 5.5, it is suggested that, the existing relationships between contracting firms and farmers are weak and unstable. Lack of trust between parties is the major problem and the main source of contractual weaknesses including side-selling.

Inadequate availability of resources

Another cause of poor contract performance is related to scarcity of resources. There is scarcity in particular of financial capital as it was earlier presented in Table5.4.The

influence of contract farming as an institutional mechanism of coordinating firms' supply chain remains limited in the target areas of quality and volumes of material produced due to limited funds for both firms and farmers. There is no credit assistance. There is no credit guarantee schemes to enhance creditworthiness of farmers and firms. Lack of finance limits access to better and adequate seeds by farmers. Firms find it difficult to expand their activities in contract projects including facilitating availability of affordable seed due to financial constraints.

Table 5.5: Challenging issues regarding contract farming and sunflower supply chain

Outcome Area	Findings statements from processors
Perception on contracts	• Most small scale-farmers are not reliable and honest partners in contracts(firms D,E,F and G) • Higher level of income poverty hinders some farmers from acting independently in contractual agreements, they are easily lobbed by non-contract actors hence violating in transactions • Contract farming is not feasible unless there is free money(i.e. donor money) to facilitate the process(firm E) • Farmers need more education on contract farming system
Price	• Price cannot be pre-specified. Both processors and farmers believe markets are better placed in determining selling price. • Markets however provide a loophole for opportunistic behaviour (moral hazard behaviour). • Processors feel farmers cannot stop side selling
Quality of Output	• To ensure quality, firms supply improved seeds to farmers through contractual arrangements • But they do not verify quality during procurement, there no fixed contractual procurement. • Overall quality of oil seeds produced is improving; better yielding seed is increasingly being used as its production gets closer through local seed multiplication. • There is increasing awareness on advantages of using improved seeds in terms of increased productivity and income. • Greater level of quality output is yet to be attained, majority farmers still consider improved seeds are not available and are expensive, hence opt for local seeds or just mix-up local and improved to meet their seed needs
Volume of seeds	• With contractual production, overall local production is rising but still it cannot fully match the current market demand • No easy access to finance to facilitate expanded investments in the sector
Regulations	• No specific legislation to support contract farming • LGAs are not effectively involved in formulation and implementation of contracts.

Source: Research data, 2013

Overall, it can be said that, most present contractual relationships established are not yet powerful enough to ensure optimal supply of produce needed to ensure continuous manufacturing process by firms. Financial constraints; lack of credit assistance and credible credit guarantee schemes are underlined as the central problems holding back efforts of firms to manage well their supply chain.

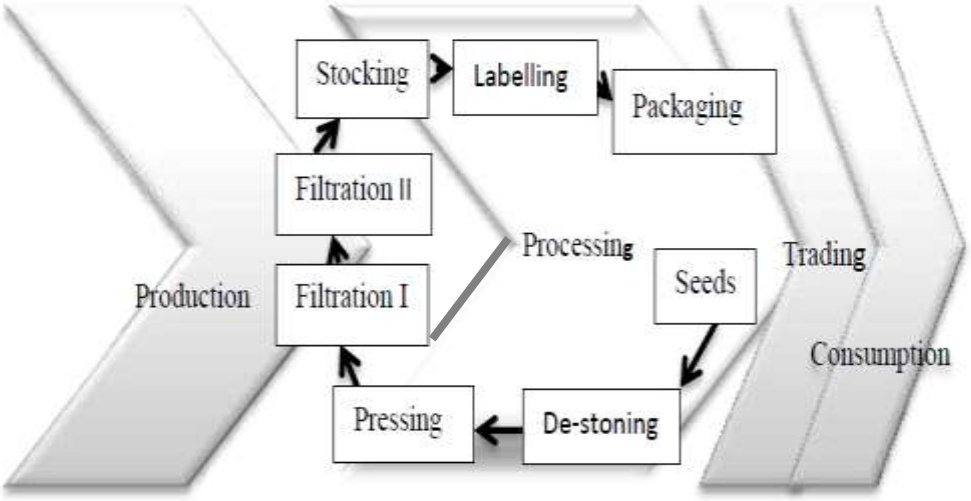
5.7.3 Coordination in processing operations

This section describes state of performance of firms in their efforts to produce end-products that have ready markets. It highlights the activities, achievement, and constraints confronting local oil firms in their processing or oil manufacturing stage. A firm can enhance value chain development if the activities it performs can effectively add value to its end-product, such that, it is able to sell its products in high-value product markets, which are profitable markets. This section evaluates the actual activities performed and analyses the value additions achieved taking into account the level technicalities involved, the level of competitiveness achieved during conversions and transformation of raw materials into end-products (i.e. oil and seed cakes).It also examines relationships developing in the process.

The state of processing technology

There are many value adding activities carried out within the firm premise from the stage of receiving seed produce from farmers, through to production of edible oil.

Figure 5.3: Processing Progressions



Source: own construction based on Research data, 2013.

All firms so far are capable of producing just filtered edible oil as shown in Table 5.6. Filtered oil is technically still containing some impurities such as wax, iron sediments, and water content which make it less suitable for human consumption and it is classified by both TFDA and TBS as low quality product. It would require secondary processing, a refinery process to attain fine quality. Unfortunately, as was learnt during the survey, none of the firms visited is currently able to refine oil. This tells that, all the internal activities; de-stoning, pressing, filtration I and II, stocking, labelling, and packaging are not able cumulatively to bring about the standard quality final produce i.e. clean and refined edible oil. As indicated in Table5.6.

Table 5.6: Processing and quality of output

	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Seed crushing capacity in Metric Tons/day	10	5	15	5	50	15	5
Actual Crushing MTs/ day	2.8	2.1	6.3	2.1	28.0	3.2	1.4
% Total capacity	(28%)	(42%)	(42%)	(42%)	(56%)	(21%)	(28%)
Quantity oil produced/day in Litres.	800	600	1800	600	8000	920	391
Quality of oil	Filtered	Filtered	Filtered	Filtered	Filtered	Filtered	Filtered
Development agenda	Procure modern machine	Procure modern machine	Procure modern machine	Procure modern machine	Procure modern machine	Procure modern machines	Procure modern machines

Source: Research data, 2013

As indicated in Table 5.6, all firms achieve limited value additions at various stages of manufacturing and produce identical end-products in terms of quality level. When asked why this was the case, all firm owners had the common opinion, that technological limitation was the major reason. The current technology in use was the only one affordable to most processors. It dictated the quality products manufactured. Firms however, have substantial physical product differentiation along the lines of branding packaging and certification, and competitiveness is gained along these lines in both local and national market as will be explained in section 5.7.4.

Further interviews with firm owners revealed that, all firms use China made machines with the exception of firm E which has in addition to Chinese machine, one similar plant imported from India, and firm B which has imported a used *rose down* plant from South Africa, but made in England. These processing machines, it was argued, are cheap and therefore easily affordable, but they are of low or old technology. They can only crush and filter oil and cannot carry out advanced

processing to purify oil. The current technology under use is therefore inadequate. All firm owners recognized this problem and when asked what their thoughts were, about the problem, they all claimed they had plans to purchase modern equipment/plants. Firm E in particularly was able tell that new plant would be installed in 8 month time. Firm E has long established plant site and appears to have larger capital, both fixed and working capital compared to other oil processors in the area of study.

In terms of seed crushing capacity Table5.6 shows that, all firms operate under capacity. First, the common machines used are small machines with seed crushing capacity of 5Metric Tons[20] a day. Of all firms only one firm (firm E) is able to utilize at least little more than half capacity of its plant, the rest operate at below 50% capacity as indicated in Table5.6. Underutilization of capacities suggests resource waste. When asked for the reasons why this was the case, all firm owners blamed inadequate supply of oilseed for this situation. That, total seed produced in the area is not yet enough to meet the needs of all plants taken together. The owner of firm A had in addition a point that frequent breakdown of her machines was another very critical hindrance to optimization in oil manufacturing. She was of the view that Chinese machines are not strong and durable.

Regarding the volume of oil produced, it is as shown in Table5.6, that oil produced per day does not exceed few hundreds of litres per day. This small amount of oil produced is explained by the fact that, firms currently cannot utilize fully their production capacity due to lack of adequate supply of raw material. But also as was revealed during interview with the owner of firm B, low oil productivity was due to poor technology of oil extraction used. The current average production of 20 litres per bag of 70 Kgs is low. In larger firms with better technology, the same quantity of raw materials generates up to 37 litres of oil as shown in the next section.

[20]This is low when compared for example to small plants within big firm like Murzah Oil Company where a single plant (small) can crush 300MTs per day.

Common barriers in the processing stage

All processing firms in the area seem to face similar constraints in their efforts to produce end-products that find a way to high-value markets, these include;

In adequate availability of raw material

The main feature of oil processing structure as analysed in the previous section is that of extremely low oil production. This small amount of oil output is caused by small amount of oilseeds as raw material available. All processing firms do not have enough raw materials for processing all the year round to utilise fully the capacity of their plants.

This implies that, there is generally a low oilseed production in the area. It also suggests a still limited capacity of firms to effectively engage well the small holder producers to ensure there is coordinated production to meet current level of material demand. Despite running contract farming, several reasons are advanced by processors for this unimpressive return on contract farming. The major ones are lack of sufficient capital and lack of sufficient knowledge on contract farming system which is a new system in the area.

Poor technology

There are two aspects of this fact. One, the common technology and machinery being used currently by all firms is of low level in the sense that, the final end product that can be obtained with technology is only filtered type of oil. This is edible oil whose quality is perceived to be of low quality by both TFDA and TBS. For it to attain acceptable quality standard, it would need to undergo secondary processing (refining). Two, the current technology has limited ability to extract efficiently oil from raw seed. At the rate of 20 litres extracted from a bag of 70Kgs currently the technology does not optimize output from the extraction process.

This amount is low compared to what is extracted when appropriate technology is used. Large firms like Mount Meru Miller Limited which also obtain raw materials from local producers can for example extract up to 37 litres of oil from a bag of

70Kgs (MMML,2010). Thus, proper technology would not only improve the quality but also the quantity of the final product. It would also signify improved coordination in attaining specific know-how in the value chain process.

Limited capital

There are two aspects of this problem as well. One, owners of local oil processing firms understands their inefficiencies in terms of technology. They all have in their development agenda, plans to upgrade their plants as indicated in Table5.6. The major constraint holding them back is lack of investment capital to purchase modern plants. This problem is further aggravated by the fact that firms (all of them) as revealed during interview lack strategic linkages with financial institutions in particular the local commercial banks. They complain of high interest that is prohibitive in local commercial institutions. They cannot secure economical loans which would help them expand and improve their investments in manufacturing. Ability to purchase modern processing machineries and building of silos with capacity of storing enough tons of seed would enable continuity in processing activity throughout the year.

The other aspect of this problem is related to lack of working capital (the liquidity problem). Firm A for example despite being successful in mobilizing raw material supply through its successful contracts, yet it cannot operate all the year round due to low capacity of stocking raw seed resulting from lack of sufficient working capital. Processors lack access to affordable loans. There are persistent complaints that interest rate usually at between 19 and 23% charged by local financial institutions including the commercial banks are very high and prohibitive. Processors own suggested solutions to the problem include; 'the government should direct banks to provide long-term loans at reasonable interest rate'.

High operational costs in processing stage

There is a whole host of problems constraining processing related to costs. The most pressing problem is high cost of electricity. There are two aspects of electricity problem stated by processors. One, power is very expensive; this problem is aggravated by the low state of technologies used in processing. For instance, many firms operate with a 25 Horsepower motor. This is the same for firms pressing as few bags as 46 bags per day and those pressing 100 bags and above. Power is thus very costly especially for smaller firms. There is no flexibility in technology choice. Two, there are frequent power failures, according to the managing director of firm D, power cuts are more damaging than the high costs associated with electricity. When power goes off abruptly while machines are still loaded which is often the case, there occurs production system jam which takes about 3 hours to rectify. In some cases power cut cause collapse of some machine parts and the company has to repair such parts now and then, which is a costly undertaking.

There is also a burden of obligatory costs related to levies, these are many, and some of them like crop levies are quite nuisance. Road blocks installed in villages to collect levies from processors are unnecessary. They only serve to create difficult business environment because they increase hours or days and costs for transportation of raw materials from producers to processing sites.

5.7.4 Marketing of sunflower products

Oil and seed cake produced are sold on the domestic market. The market areas as indicated in Table 5.7 comprise the immediate towns and villages in Dodoma and Singida areas but also distant areas in other parts of the country. Improving inter-regional road networks facilitate inter- regional distribution (local trade) of products. Products can now easily reach far away markets such as Njombe, Songea, Iringa, Mbeya and the most populous market, Dar Es Salaam in the east of the country.

Market access of local oil manufacturers

Despite the fact that the country imports edible oils, the local processing firms find ready even though competitive market for their produce. Based on interviews with processors, there are two main factors favouring growth of the market for the locally produces oil. One is its relatively low price. The retailing price currently at Tshs 2500 per litre is relatively cheaper than the imported oil or local oil made from imported raw materials sold at Tshs 3000 and above depending on the type of oil.

At local super markets the price of imported edible oil even the same sunflower oil from for example Belgium is as higher as Tshs 7300 per litre. The price of local oil on the other hand is even lower when purchased at factory gate. The price per litre as observed during the survey was just Tshs 2300 at factory gate. Another source of market strength relates to easy availability and accessibility of the manufactured edible oil. Most oil processing firms have their locations in the same areas where people live. They therefore provide easy reach for local customers.

Table 5.7: Summary of marketing issues

Firms	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Product	Oil	Oil	Oil	Oil	Oil	Oil	Oil
Destination Markets							
External market	0%	0%	0%	0%	0%	0%	0%
Domestic market	100%	100%	100%	100%	100%	100%	100%
Price-de termination	Market	Market	Market	Market	Market	Market	Market
Price/Litre	2300 2500	2300-2500	2300-2500	2300-2500	2300-2500	2300-2500	2300-2500
Selling skills	Packaging &	Packaging &	Package sizes &	Packaging &	Packaging &	Packaging &brand	Packaging &
Distribution	brand	brand	brand	brand	branding		brand
car	Non	Yes	Yes	Non	Yes	Non	Non
Selling points	Yes	No	No	No	Yes	Yes	No
Major domestic Market	Dar	Dodoma	Dodoma Mwanza	Njombe Songea, Iringa, Dar	Dodoma	Dodoma Dares Salaam	Dodoma , Dar , Iringa
Certificates TBS&TFDA	No	No	No	No	Yes	No	Yes

Source: Research data, 2013

There is in addition, an improving market logistics; most firms are able to package their produce in various sizes to meet the needs and budget of multiple consumers. They have pouch packing in 500gms and 1 Litre but also large packages in 5Litres, 10Litres and 20Litres and each has its own brand name. This is very important. Efforts to meet customer's preference strengthen competitiveness among firms, a fact that enhances quality improvement of the manufactured products. This however, does not remove the observation made earlier that the achievable quality of oil produced is limited by existing technology. Competition therefore is basically the "within technology competition." due to limited value additions.

5.7.5 Market constraints

In adequate marketing logistics

Local processing firms suffer from inadequate marketing logistics. Of all firms surveyed only two firms E and F indicated to have regular trade relationships with its customers from distant districts of Njombe and Songea and the city of Dar Es Salaam respectively. These are customers with ability to purchase large quantity of product of up to 20tons of oil at a time. They contribute substantially to sales revenue of the firms once they carry out their procurement.

Distribution network of other firms is still concentrated mostly around the same area they are located. They have a few sales made in the distant domestic markets. Small local retailing enterprises are major customers of firms' products. Firms lack efficient facilities to enhance distribution. There are only two firms E and F which have established own permanent selling points in Dodoma town centre. And only two firms B and C who own small trucks to facilitate local distribution. All other firms depend largely on customers who buy directly from the factory. These firms are less connected to markets further away.

Difficult compliance standards

Table5.7 shows that, of the seven firms only two possess standard mark licenses from the Tanzania Bureau of Standards (TBS) and the Tanzania Food and Drug

Authority (TFDA). At enterprise level, possession of standard marks serves to increase acceptability of a product(s) in the market. Due to product quality problems most firms do not have required certifications. As a result many remain selling informally in local market at the same time striving to qualify for the certificates. It takes a lot of efforts and investment to qualify for these standards certifications. It would require substantial investment in modern machinery and equipment.

In short terms therefore, firms have limited market options, they must only concentrate their selling plans on domestic market. Even the firms which have met these national standards are not yet able to export their products. When asked why they could not export, the response was 'we don't have fortification mark'. Product fortification guarantees international acceptability of a product. A firm cannot export its product if it is has not attained international standard compliance.

Unfair competition from edible oil processed from imported crude oil.

Finally, interviews with managers of the processing firms revealed also that, their oil faces unfairly a strong competition in national market from edible oil locally manufactured from imported palm crude oil material. Crude oil is imported duty free by large oil processing firms in the country. It is used to produce quality and cheap oil which out-competes local oil made from locally produced oilseeds. "Every time the domestic market is flooded with edible oils manufactured from cheap imported materials like Korie, demand for locally produced oil falls and the total revenues from our edible oil business falls" the manager of firm A[21] lamented.

5.8 Conclusion

In broad view, contract farming programme goes beyond the sales agreement between farmers and contracting firms. It needs to be a comprehensive package programme which recognises the role and importance of various actors along the contract crop value chain. In overall, the diagnosis of six contractual arrangement

[21]Interview t with the manager of firm A was held on 15th July, 2013 from 10.20 am to 12.00 at factory site in Iguguno-Iramba district in Singida.

involving different firms in this study suggests that, effectiveness of a firm in coordination of the crop value chain depends on the availability of services particularly financial services, and capacity service providers who may be the government, the NGOs or Business Development Organisation(BDOs).

The share of firm produce procurement obtained through coordinated supply chain is still very small for many firms. It is revealed that most firms lack needed investment and working capital to ensure adequate facilitation of farmers in accessing production support/ services and market outlets for their produce. Weak facilitation of expected service delivery on the other hand fails to foster trust between farmers and firms. Side-selling emerges as a stumbling issue in ensuring sustainable contract farming. This implies that the government and other stakeholders need to explore better options that will ensure adequate availability of financial resources for private investors. Commercial banks in Tanzania are risk averse. The cost of capital especially for small firms is very high. It is difficult for many firms to access credit facility due to lack collateral even when facility is available. It is, thus, important to develop financial regulatory environment that is conducive for small firms in terms of accessibility to finance and necessary business knowledge and skills.

The issue of accessibility to proper technology is also very important. Linking of local manufactures to global market through export is limited due to poor quality products resulting from poor technology. As revealed in the study findings, technology uptake among small local processing firms is highly limited. There is limited financing for uptake of appropriate oil processing technologies which need to be addressed. The government may work in partnership with the private sector to address this, by for example developing jointly funded programmes e.g. establishing manufacturing clusters where technology may be gradually but at a reasonable cost transferred to many small processors involved in sunflower edible oil manufacturing.

In general terms, the relevant policies which already exist like Small and Medium Enterprises (SMES) policy and agricultural policy are good, but they need to be made effective. Policies are relevant and good only if they can bring about positive

impacts intended, if not, they should be replaced or modified to address pertinent issues prevalent in agricultural sector and those emerging issues pertaining contract farming business. Development of specific policy on contract farming system would help a great deal in enhancing market development in current market conditions for smallholder farmers who are the majority in the Tanzania economy given the potential benefits associated with contract arrangements as highlighted in this chapter.

The analysis in this chapter leads to the inferences that, the probability of a local sunflower oil processing firm effectively influencing the value chain depends on whether a firm can successfully coordinate seed delivery services, ensuring quality varieties are available in adequate quantities at affordable costs and provide profitable product market. It is also revealed that the more the contracting firms are able to facilitate farmers' access to knowledge, skills, and specific good crop husbandry practices, the more the value chain gets stronger. However, it is also revealed that most local processing firms which are small enterprise by their characteristic slack adequate financing. This calls for more concerted efforts of the government, local government authority, Non-governmental organisation and the private sector to establish more conducive business environment. Establishment of specialized bank for agricultural development for example would allow farmers and firms to borrow funds required to finance agricultural activities. There should be even small loan schemes within the villages to help farmers

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

6.1 Introduction

This chapter summarizes the main findings derived from the research. Attempt is further made to synthesise the major findings and draw some conclusions and policy implications regarding the usefulness of contract farming system and propensity score method as a technique of impact measurement or programme evaluation.

6.2 The role of farming contracts

Contract farming system is a form of market organisation that is claimed has potentials of improving technical production efficiency, increase incomes of smallholders and enhance the overall crop chain development (Minot, 1986; Ruben &Saenz, 2008; Prowse, 2012)

Sunflower production contracts practiced in Kongwa District are initiatives undertaken by two local private agribusiness firms (sunflower oil processors) with the objectives of promoting sunflower production among farmers who, by their characteristics, are small scale farmers. The two companies; *Company A* and *Company B* based in the Tanzania's main central town of Dodoma about 86 Kilometres away from Kongwa District seek to secure access to farmers' produce in large quantity and quality in a consistent way in order to improve their edible oil manufacturing business.

Apart from being assured of the product market, farmers in addition are supported in their farming with basic inputs, mainly seed on credit or cash. Where credit procedure is followed, costs involved are recovered when the produce is sold. A reasonable percentage of sunflower farmers (46%) have been able to fully access and use improved variety of seed namely *record*, which has higher yield per acre compared to traditional varieties. Input access has motivated more farmers to participate in contract farming. A bout 884 households (14.7% of all households) in

Kongwa District were in contract farming during the agricultural season covered by this study. There has been increase in land per household allocated for sunflower annually, ranging from an average of 3.3 to 3.7 acres from an average of 1or less an acre in years before contract farming was introduced. Total production in the district has increased over time although with some fluctuation associated with weather variability. The average yield per acre of contract farmers is on average 24% higher than the yield of non-contract farmers.

6.3 Contracts meeting challenges of contractual problems

Contracts are inherently characterised by major problems of moral hazard, adverse selection, hold-ups and other known risk related to production and marketing. Good and efficient contracts are those which can overcome these integral contractual problems by designing sufficient incentives and working risk sharing mechanisms. In spite of some recorded benefits and successes of contract farming arrangement in Kongwa, there is also a good deal of contractual problems. As discussed in chapter two based on the contractual aspects of coordination, motivation, and cost minimisation, as suggested in Bogetoft and Olesen (2004), there is recognizable weak coordination in the implementation stage evidenced by incompletely fulfilled contracts or completely un-fulfilled contract agreements. The inability or unwillingness of contracting firms to fully meet their obligations of seed supply in particular, and side selling on the side of farmers are regular and main problems facing the current sunflower production contracts in Kongwa.

Current contracts also do not address the issue of price risk with adequate precision. There is no forward agreement on price. Parties to contracts agree to rely on market mechanism to determine selling price when time for exchange is due. This selling arrangement however, does not arguer well with the spirit of contract arrangements. It rather encourages some opportunistic behaviour which undermines productive behaviour anticipated under contract arrangement. One important feature regarding selling of sunflower harvest is its ever rising price. Price does not fall at any time of the season after harvest. Market price however, is lower at the beginning of the

selling season following high supply experienced in the immediate post-harvest period. The price offered by contracting firms purported to be indicative price, does not match well the high farming expenses incurred by a farmer. But, over time, prices rise and famers who reserve their harvests can sell at a future date at a much higher price. When price is lower is usually where contract firms prefer buying the produce in bulk from their contract farmers. But as buying exercise starts, free traders, and middle men too, join the exercise. To ensure an edge in competition against contract firms, new entrants offer a market intrusion price. This is a price which does not realistically or necessarily react to demand and supply of the produce, but a price meant to create disloyal competition. The intruding firms pledge and offer a price that is a bit higher allegedly to provide smallholders with great revenue from their produce but which in actual fact is meant to lure contract farmers.

Realistically this is the expected behaviour under market inclined business environment. This however, does not conform to the spirit of contract farming and cannot be a viable entry point to seeking solutions to the crucial long term problems related to production and marketing facing the farmers. Even though contracts lack forward agreement on price, it is anticipated that rational farmers would behave in a way that recognizes fulfilled agreements on other items such as supply of seeds and tools under contractual arrangement, and they would be willing to make certain short term sacrifice for longer term gains in those contract areas well fulfilled. This outcome is detrimental to continued contractual trade relationship. Firms become de-motivated in subsequent contractual agreements and remain unwilling to invest in contractual activities.

In general, contract farming arrangement that lacks forward price and in particular a premium price fails to create sufficient incentives Will (2013). Low incentives fail to generate needed loyalty (as opposed to opportunism) to keep contract arrangement strong. It can be inferred from this discussion that contract farming without forward contract price is bound to fail to bring about meaningful effect in revenue generation from the sunflower farming activity.

It is also notable that, the current contracts are not cost effective as expected. This is depicted by the fact that firms still have to deal (i.e. carry out transactions) with a big number of individual small-scale farmers who are unevenly spread across villages in the study area. Farmers' organisations that would facilitate collaboration and prevent adverse selection are either non-existent or exist in very weak conditions. Transaction costs involved when dealing with unorganised farmers tends to remain excessive and a challenge for performance of the contract firms.

There is also inadequate attention paid on grades and standards of produce. While farmers are encouraged to use better seed variety for increased yields, the current contract agreements do not specify how quality will be reflected and observed in terms of price during procurement process. There are no grades and standards bench marked which must be followed during procurement process. This keeps farmers less motivated in adoption and use of quality seed varieties. Which is why, some farmers still deliberately choose and use seed from previous harvest obtained from certified seed believing there is no difference in productivity. Moreover, there is also no additional gain in terms of price when it comes to selling the produce from certified seed or from seed obtained from own previous harvest.

The current contracts are founded on mutual interdependence and expectations between farmers and processors. They are simple and informal contracts which are freely entered. However, respect for, and trust in these contracts is minimal. One explanation given is that there is missing link expressed by lack of active role of the local government at district level in contract design and implementation. It should be recalled that, villagers hold with higher respect their local governments. Involvement of local government of any level in transactions between farmers and the contracting firms, would signify and instil sense of security and honest in their dealings. Handling of contract breaches and disputes would be much more feasible.

Right now, issues of penalties and arbitrations are not well addressed. Where farmers have violated agreements firms do not have easy ways of dealing with them. This is attributed to the fact that, local government authorities at district level are not

effectively involved, and have no clear roles in safeguarding interests of the parties in the existing contracts. Costs that would be involved if firms decided to sue a farmer under normal legal procedures would be excessive. The only recourse remaining applicable is discontinuation of a farmer from next season contract agreements. Farmers equally find it difficult to pursue a case against a firm which does not fulfil its contractual agreement. They do not find support from the local government authority which claims has no idea of the existence of farming contracts since the district authority was not involved in organisation or formulation of the contracts at the beginning. Farmers, in addition, are not well organised for example into producer groups capable of bargaining strongly for their interests or even capable of litigating a firm that violates contract agreement.

6.4 Effects of contracts on technical efficiency, productivity and income

As revealed in chapter three and four, other things being equal, farmers under contracts are technically more efficient and experience positive contract effects on their incomes. In a study sample used, significant predictors of technical inefficiency are age, land endowment per household, non-agricultural assets and the geographical location of the household. In order to establish if estimated difference in technical efficiency and income can be attributed to contract participation, a treatment effect analysis using propensity score matching method and the treatment effect model are used and results are as summarised in following sections.

6.4.1 Prediction model of the contract participation

As revealed in chapter three, contract farming has positive effect son production technical efficiency and income of farmers. However, despite these gains known to be associated with contract participation, and despite that all farmers in all villages are eligible and free to participate in contract farming, not every household in the sample is in contract programmes. Thus, the first issue addressed in this thesis was to find out why some households choose to participate in contracts while others do not. Couldn't it be that contract farmers are inherently better off farmers who are always likely to self-select into contracts whenever opportunities occur?

Results of the propensity score matching method indicate that, there are four variables, together with geographical location of a household which significantly favour participation in the contract. These are, age, land endowment per household member and having economic ability to make savings by means of purchasing assets including stocks of seasonal crop harvest for future re-sell or exchange. Owning a bank account, accounts negatively the probability of participating in the contract, suggesting that, contracts are less attractive to households who are not cash strapped. This might be because; wealthy households can afford buying farming resources with their own money and do not have to rely on contractual hand outs. Farming contracts, which are largely resource (seed) providing contracts, may therefore not be attractive to such households

6.4.2 The average treatment effects by NNM and KBM algorithms

The usefulness of the propensity score approach in estimating impact of contracts on variables of interest controlling for selection bias is attested by results obtained by Ordinary Least Method (OLS).Results by OLS method are similar in terms of sign, significance but differ somewhat in terms of magnitude, revealing the significance of carrying out treatment effect analysis. Propensity score method is useful once independence assumption and homogeneity in data in the sample is achieved. It helps to solve the problem of heterogeneity and self-selection bias and helps to determine the actual effects caused by the intervention.

6.4.3 Income effect

The test on the appropriateness of the treatment effect model gives results which suggest that, there is no problem of self- selection bias in the dataset used. The condition of correlation between the two errors (i.e. the error ε of the outcome equation and the error u_i of the selection equation) being nonzero fail to hold implying that the treatment effect model would give biased results. This also tells that ordinary least square model would suffice in determining the income effect of contract. Studies establishing causal effect relationship need to take into account the

problem of self-selection in order to obtain unbiased and consistent estimates.

6.5 Local oil processing firms in coordination of the sunflower value chain

Farming contracts are often organised by individual private agribusiness firms, the processors. Therefore, chain development depends on policies and regulations which facilitate private investments particularly those which favour development of backward and forward linkages in the chain. It also depends on availability of support infrastructure often provided by the government such as rural roads, electricity and many more public services (Stiglitz, 1989). On the other hand, effective chain development depends on the capacity of agribusiness firms involved to coordinate the dynamics in various segments in the chain.

An examination of the factors critical for success or failure of contract farming projects focusing on the ability of firms to coordinate supply chain, processing and marketing process(chapter5), shows the importance of both public-private collaborations, and innovativeness at firm level . The usefulness of public-private collaboration is illustrated by the examples of firms A and B. With the support from their respective District Agriculture and Livestock Development offices, they managed to carry out seed multiplication project and resolved effectively the problem of low availability of quality seed for their farmers. The projects in turn, improved productivity of farms and the overall supply chain performance. Contracts appear to thrive where contracting firms are active and innovative. Non-contract practices namely, establishment of demonstration plots, use of phone network for information dissemination and even strategic recruitment of more women in contracts have contributed to establishment of well performing contracts.

In rural setting, agricultural commodities such sunflower produce find a thin market because almost all farmers grow the same commodities. Attempt to trade in distant urban market such as Dodoma and Dar Es Salaam is often uneconomical due to high transportation and transaction costs involved. Moreover, access to high value market and international market is limited due to restrictive safety and quality standards

required. Thus, the arrival of private contracting agribusiness firms, despite the short comings observed creates an improved marketing. Market organised on contracts reduce transaction costs and facilitates farmers access to basic inputs like seed, and helps in mitigation of production and marketing risk. Contracts thus, help in improving and sustaining the chain integration.

6.6 Contracts meeting challenges of chain integration

Chain integration requires building and cementing long term relationships and trust between farmers and agribusiness. Both price and non-price factors are important operationalisation of the process (Hobbs, 1996). While the contracts examined in this thesis have proved to be successful in various ways, there remain some critical challenges which need be addressed to ensure that contracts grow into a more reliable tool of chain integration in the future. One main challenge identified relates to finance availability. This constitutes a huge challenge not only to contracting firms but also the farmers.

A low financial capability hinders firms from fulfilling effectively their contractual obligations especially that of input provision. As the result, there remains uncertainty related to seed availability. This reduces confidence of farmers in contracts. In situation where inputs are adequately provided, for example the experience of firm A, sunflower produce is timely harvested, collected and transacted in adequate amount from farmers to the next chain node, the processor. In contrast, where trust and loyalty are not strong following weak provisions, supply chain differs in terms of quality of produce transacted and the destination of transactions.

There is also an issue with local processing firms accessing appropriate processing technology. Attaining capacity to produce quality sunflower edible oil by local firms remains a challenge, and without this capacity, there remains limited value-added generation. Processors currently do not satisfactorily meet demand of forward stakeholders e.g. supermarkets and executive hotels and export markets. This daunts chain integration development. It is notable also that, while local processing firms

are responsible for meeting and maintaining the quality and safety standards set by both the Tanzania Bureau of Standards (TBS) and the Tanzania Food and drugs regulatory Authority (TFDA), there is little support from the same agencies or the government itself provided to help them upgrade their production system to meet the set standards.

Developing capacity to carry out further processing (refining) by local firms is a desirable strategy that can bring about sustainable chain integration. Contacts currently have not yet managed to mobilize concerted actions to enable mobilization of sufficient resources to carry out investments in better technology and other product innovations by local oil processing firms.

6.7 Policy recommendation towards improving contract farming

As writing of this thesis progressed towards the end, there was still no any official public document that could be referred to as national policy or guideline specific to contract farming system in the country. However, as revealed in discussions in both chapters two and three, the need for formulation of specific policy to cater for development and maintenance of contract farming system in the country cannot be over emphasised.

A policy consists of aims and objectives, targets and strategies for realization of the intended outcomes. Contract farming policy envisaged here to be pursued at national should aim at;

i. Promoting the establishment of contract farming schemes to improve economic opportunities for farmers and agro business firms.
ii. Maximizing returns on smallholder farming business to smallholder farmers by ensuring efficient supply of quality inputs like improved seed varieties and forward profitable contract prices.
iii. Ensuring agro-processing firms secure consistent supply of quality raw material from contract farmers and achieve growth overtime
iv. Fostering of formation and performance of organisation of farmers and

traders/processors to ensure there is marketing system that can effectively serve both farmers and firms.

v. Promoting establishment of development community centres in districts where farmers would be educated on good farming practice, legal knowledge, technical issues, and financial matters.
vi. Promoting collaboration between local government authorities at District level and private processing firms and farmers as base for successful business transactions.
vii. Developing and maintaining integrated value chain at local and international level that is favourable for transition from subsistence to smallholder commercial production
viii. Strengthening information and monitoring of marketing programme.

In order to achieve these objectives, concerted efforts need to be taken to formulate and implement appropriate policies. It is proposed here that three policy areas need to be taken into account. These are production policy, and policies related to technological development, marketing, and consumption of sunflower products.

Guide on designing of good contracts.

Learning from successful and failed contracts as discussed in this study and also from the literature on contract design (Bogetoft & Olesen, 2004; Will, 2013). Decision to develop contract farming need to follow a guideline which includes important steps as follows;

i. Identification of opportunities of making profit for both parties to contract and the associated risk and costs.
ii. Identify or outline potential production areas and the type of farming system, land organisation to be used, whether individual separate lands or blocks of land.
iii. Investing enough time and money into assessment of the feasibility of opportunities, risks and prospective costs identified to ensure developing contracts are secure and sustainable and not false hopes are created among

farmers e.g. easy market access and premium prices. Viable returns on investment for both parties are a key to success of contract farming set.

iv. Identification of non-financial needs e.g. recognition of CF by the local government authority and other interested institutions which can assist in brokering linkages. But also help in trust-building and monitoring. Formation of farmer groups or associations.

v. Identifying financial needs of both farmers and firms based on the capacity development needs. Recognising innovation and upgrading needed which are crucial for CF success.

vi. Outline solution to anticipated problems during operation related for example to side selling and bad weather conditions.

vii. Selecting appropriate model of contract farming business, does it cover credit and technical services, inputs and other services including those external to contracts.

viii. Outline the appropriate structure and management of the selected contract farming model.

ix. Plan a gradual CF growth to reduce risks and costs of necessary learning loops.

x. Constructing codes of practice which should be issued to farmers, firms, local governments and even NGOs involved in contract farming projects.

xi. Provision of legal protection; a set of laws specifying duties and forbidden acts by all parties to contracts.

6.7.1 Production policy

Within the same current agricultural policy, there should be amendments to include clear stipulation of contract farming system along with its full prescriptions regarding to facilitation role firms in provision of inputs, at least the basic inputs such as quality seed varieties to ensure there is optimal use of other resources such as land and labour, and provision of credit, non-credit services and product reliable product market. The local government authority, through their department of agriculture, irrigation, and cooperatives should take an active role in ensuring there is better

resource distribution and betterment in farming practice. Farmers should be encouraged to use compost and manure to improve and preserve soil quality. Labour should be improved through regular training and extension advisory services. With regards to other factors of production especially those that require substantial amount of money in their acquisition such as draft power, the district council should facilitate formulation of farmers' self–help groups and organisation through which they can easily be linked to financiers and also be easily guaranteed by their local government authority or any other authority in acquiring of funds.

The institutional context which permits the enforcement of contracts is very fundamental (Wu &Roe, 2007). An appropriate judicial framework is a basic condition for contract farming to take place in precise way. It induces certainty; it enables negotiations between farmers and processors that lead to agreements which are binding to all parties. Under guidance of the local government authority, it should be possible to draw contracts with detailed descriptions of the rights and obligations of all parties to contract, for example with specifications on quantity, quality, price and possible areas of breaching and the expected reactions and actions by parties. There should be strong presence of the local government authority or its agency to ensure fair dealings between farmers and processors. Government should require or provide neutral arbitrators in case of conflicts.

Public-private partnerships should be promoted by way of creating an enabling environment, which favour development and expansions private enterprises, as well as joint ventures (preferably at 50% firms 25% farmers' association 25% government).This will make it possible to raise funds for upgrading basic infrastructure and perhaps acquire assets like refinery plants and silos which the individual firms or farmers association alone or the local government alone would not afford. Collaboration between individual enterprises, farmers' organisation, and Local Government Authorities (LGA) at district level, even at regional level will be useful in raising funds and in motivating farmers.

Additionally, farmers' organisations need to be maintained, there is a general lack of management capacities of farmers organisations. The LGA should devise regular training programme on management of associations of farmers as well as processors.

There should be state legislation supportive of contract farming which make it a requisite for a contracting firm to work with farmers in their groups or associations rather that farmers as individuals.

6.7.2 Technology development policy

Contracts should be promoted within the scope of agro-industrial development programme. Agribusiness firm play a significant role in development of sunflower chain. Their processing capacity and standards of manufactured produce are currently very low. A policy plan is called for, to address the issue of accessibility to affordable and appropriate technologies by local processing firms. When a crop is destined for commercial production, agribusiness firms most suited are those which can acquire appropriate technology to produce output with acceptable quality and safety attributes, which enhance up grading in value-chain.

The major drawback facing processing firms currently is difficult procedures and conditions in accessing finance. New approaches in accessing loans from formal commercial institutions need to be explored. Presently, conditions of acquiring loans are not favourable for both farmers and firms. This is evident in the fact that most commercial banks in the currently charge a higher interest rate that is 19% or above annually which is exorbitant. Cost of obtaining loans remains generally excessive.

New approaches need to be considered and adopted to ensure that, in the final analysis cost of acquiring capital is reduced and local investors can access capital they need to invest in oil refining plants. Such would enhance value addition, enabling access to high–value markets with premium price and improved profitability. Establishment for example of the national agricultural development bank to provide for short, medium to long-term financing needs would provide a strong foundation for streamlining financing to the sector.

The role of Small-Scale Industries Development Organisation (SIDO) in the country is appreciated, however, the thrust for agricultural development through agro-industry development need to be revitalized by mobilizing local entrepreneurs, resources, and promote development of firms with capacity to coordinate and improve the chain integration. Farmers may equally be involved through their organisations and in cluster approach, a way that consolidates trust in contract arrangements.

6.7.3 Marketing and consumption policies

Unlike most cash crops especially the traditional non-food cash crops like tobacco, coffee, and cotton which have long possessed their formal marketing and organisation structures, sunflower does not have defined marketing organisation and structure to handle its transactions. Transactions about sunflower business right now are largely market based. This may not be the best way of nurturing sunflower business and the overall domestic edible oil sub-sector. Sunflower is fast gaining economic importance among most small holder famers in the vast area of central agricultural zone of Tanzania and other parts of the country. It may significantly gain from much organised marketing structures rather than free or marketing system where transactions are made on ad hoc basis.

The price of sunflower products; sunflower edible oil and seed cakes still command relatively low market prices when compared to their substitutes or the imported edible oils of various types. Thus, to ensure meaningful sunflower market development, there is a need to encourage participation of relevant institutions including the government and associations such as sunflower producer groups indifferent levels of the crop chain. Given the liberalized market environment, formation of strong producer and marketing associations along with concrete policies that work could encourage development of fair dealings in transactions among stakeholders in the edible oil sub sector. This could trigger off greater interest of parties in the crop in a way that would promote better production and marketing of the crop.

With regard to consumption, an overall policy plan is needed whose focus should be on developing and maintaining self-reliance in the edible oil sub-sector through import substitution development strategy. The main purpose being to reduce dependency at national level on imported edible oil. As shown in chapter 4, Tanzania currently imports over 50% of its edible oil consumed. The government should through nationwide campaign promote growth and consumption of locally produced oil particularly, the sunflower edible oil which is cholesterol free and highly nutritional.

6.8 Concluding remarks

Empirical results in this thesis support a large body of literature which argue that, contract farming improves technical efficiency of production and productivity and income of smallholder farmers (Minot, 1986; Key & Runsten, 1999; Ruben &Saenz, 2008; Prowse, 2012; Oya, 2012). This is true despite the fact that the crop considered in this study is not a standard contract crop. Unlike most studies which focus on *ideal contract crops*, i.e.specific crops with specific characteristics like; product homogeneity, high perishability, high hygiene and safety requirements and high quality requirement at the end market; and a crop being a 'hard to grow crop'; this thesis studies one of the low value crops, sunflower, where the above characteristics don't hold true.

Using primary survey data on 205 sunflower contract farmers and 195 non-contract farmers in Kongwa District and controlling for possible section bias by applying Propensity score matching statistical analysis technique and the treatment effect model, it is shown that participation in contract farming can increases production technical efficiency and productivity of farmers. It also has positive even though insignificant effect on income. The results suggest that even the ordinary crop like sunflower can also be grown successfully under contract farming system.

This thesis also contribute to impact evaluation literature by applying a relatively new statistical method of analysis, the propensity score matching method, which has conventionally been widely used in medical studies. The method which is based on

the conditional independence or confoundedness assumption, effectively address the problem of self-selection bias inherent in choice problems in observational studies like this one and helps in obtaining results which are consistent and unbiased.

Notwithstanding its weaknesses, contract farming system represents an interesting approach in developing mutually beneficial integration between agribusiness firms (i.e. processors) and farmers. It remains a better approach than the independent subsistence farming system in production and marketing for farmers and use of spot market in outsourcing raw products for firms. It has real potentials of overcoming some of the problems afflicting smallholder and processors in production and marketing. As Porter and Howard (1997) observe, CF is likely to remain, and expand as prominent feature of smallholder agricultural production in rural areas across Africa, including Tanzania; however, as Porter and Howard note," it is important that potentially pernicious aspects are contained and ameliorated" (*ibid* p.235).

This thesis has revealed that the main reason why private firms choose contract farming over other organizational strategies like use of spot market is to achieve reliable and adequate supply of raw products for their firms at reasonably low transactions cost. Current contracts are "resource- seeking contracts", however, these contracts lack sufficient incentives to attract adequate commitment of farmers to contract agreements. This revelation is important for future efforts in designing policies (as suggested in section 6.7.1) to influence the outcome of contract farming schemes. The government has a role to play to ensure that there are good contracts which can achieve efficient seed production and distribution preferably through expanded domestic seed production. Contracts which can act as a catalyst in delivery of credit including short, medium to long-term financing, and related services to bring about better development of sunflower value chain.

6.9 Areas for further research

In general terms, results from this thesis suggest that contract farming can be beneficial to small holder farmers of sunflower in terms of increased efficiency,

productivity, and total output. It is discovered that under contract arrangements use of improved inputs can be intensified leading to realisation of better yields and high quality of the crop. Promotion of contract farming is thus recommended.

However, sustainability of contract farming as an institutional forms of organising production and marketing will depend on how the local firms will manage the markets, in particular how they will develop capacity to access the higher value markets with sustainable high returns. Future research is recommended on legal and organizational issues, that is, on how and which new market relationships can be developed between small and medium local firms and the large firms operating in the country to ensure that small and medium firms which provide basic market for smallholder farmers benefit from higher returns attainable in lower segments of the value chain (higher value markets).

Studies on feasibility of such issues like sub-contracting in production and marketing and clustering would provide insights useful in formulation of better trade relationship between players in the upper nodes of the value chain and those in the lower segments in a way that ensures increased gains to all parties in contracts.

References

Acock,A.C.(2012). *A Gentle Introduction to Stata*. Stata Press Publication, Texas.

Aigner, D.J.,& Chu,S.F. (1968). On Estimating the Industry Production Function. *American Economic Review, 58.826-39*

Aigner, D.J., Lovell, C.A.K.,& Schmidt, P. (1977).Formulation and estimation of stochastic frontier production functions. *Journal of Econometrics, 6:21–37.*

Andri,B.K.,& Shiratake, Y (2003). Existence, Types and Opportunities of Contract Farming in East Java. *Bulletin of faculty of Agriculture, Saga University No 88. 43 – 55*

Agricultural Research Institute (2008).*Survey on the status of sunflower production in selected Regions of Tanzania,* Kilosa.

Augurzky, B.,& Schmidt, C. (2001).*The propensity score: a means to an end*. Discussion Paper No. 271, The Institute for the Study of Labor (IZA) in Bonn (IZA).

Battese, G.E.,& Coelli T.J. (1993).*A stochastic Frontier Production Function Incorporating a mode for Technical Efficiency Effect*. University of New England, Armidale, Australia.

Battese, G.E.,&Coelli T.J.(1995). A Model of Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics, Vol. 20. 325-332*

Becker, S., & Ichino, A. (2002).Estimation of average treatment effects based on Propensity Scores. *The Stata Journal, Vol.2, 4, 358-377.*

Bijman,J. (2008). *Contract Farming; An Over view: Agri-Pro focus Expert Meeting on Contract Farming.* Wageningen University, Utrecht, May.

Bogetoft,P., & Olesen, H.B. (2004). *Design of Production Contracts; Lessons from Theory and Agriculture*. Copenhagen Business School Press, Denmark

Bravo-Ureta, B.E.,& Evenson, R.E. (1994). Efficiency in agricultural production: The case of peasant farmers in Eastern Paraguay. *Agricultural Economics*, 10: 27–37.

Bravo-Ureta, B.E.,& Pinheiro, A.E. (1997). Technical, Economic and Allocative

Efficiency in Peasant Farming: Evidence From the Dominican Republic. *Developing Economies, XXXV-1 : 48-67.*

Carney, J., & Watts.(1990) "Manufacturing dissent: Work. *Gender and the politics of meaning," Africa, Vol. 60.No.2(1990),pp.207-241*.

Cariendo,M.,& Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Survey, Volume 22, Issue 1.31-72*.

Chakraborty, D. (2009). Contract Farming in India: Unique Solution to Multilayer Agricultural Problems?. *Review of Market Integration, Vol 1(1) (2009): 83–102*

Chang,C.C., Chen,C.C., Ching,M.C.,& Tseng,W.C(2006*). Is contract farming more profitable and efficient than non –contract farming? A survey study of rice farms in Taiwan;* selected paper for presentation at the American agricultural annual meeting, Long Beach, California

Coase, R. (1960). The problem of Social Cost: *Journal of Law and Economics.3 (1): 1-44.*

Coelli, T., Christopher, P.,& Battese, G. (2005).*An introduction to efficiency and productivityanalysis.*2nd edition. Springer

Coelli, T., Rao, D.S.P.,& Battese, G. E. (1998).An *Introduction to Efficiency and Productivity Analysis*. Kluwer Academic Publishers.

Coulter,J.,Goodland, A.,Tallontire,A.,& String fellow,R.(1999). *Marrying farmer cooperation and Contract Farming for service provision in a Liberalizing sub-Saharan Africa*. *Natural Resource perspectives;* Overseas Development Institute Number 48, November 1999.Retrieved 8 September, 2012 from World Wide Web:www.oneworld.org/odi/nrp/

D`Sliva,J.L., Shaffril, H.A.M., Uli, J., & Samah, B.A. (2009).A *r*eview of Contract Farming and Factors that Impinge Youths Acceptance to Contract Farming. *European Journal of Social Science* Volume11, Number 2 pp. 328-338.

Da Sliva, C. A. B. (2005). *The growing role of contract farming in agri-food systems development: drivers, theory and practice*. Agricultural Management, Marketing and Finance Service, FAO, Rome Retrieved on 11/2/2011 from

World Wide Web: http://www.fao.org/ag/ags/subjects/enagmarket/contractfarming.html

District Agricultural and Livestock Office (DALDO). (2013). *Taarifa ya hali ya mavuno kwa mwaka 2012/13*, Kongwa.

Dehejia, R. H.,& Wahba, S. (2002). Propensity score matching methods for non-experimental causal studies. *Review of Economics and Statistics 84(1): 151–161*

Eaton, C., Shepherd, A. (2001). Contract Farming Partnership for Growth.*FAO Agricultural Services Bulletin 145, Rome. FAO, 132pp*

Ellis, F. (1993) *Peasant Economics: Farm Households and Agrarian Development*. 2nded. Wye studies in Agricultural and Rural Development. Cambridge University Press

Errapa, S. (2006). Contract farming in Karnataka: a boon or a bane?. Research Report: IX/ADRT/113; Agricultural Development and Rural Transformation Centre: *Institute for Social and Economic Change Nagarbhavi, Bangalore-560 072* Retrieved 23/3/2011 from World Wide Web http://www.isec.ac.in

Eastern and Southern Africa small scale Farmers' Forum (ESAFF). (2013).*Seeds and Agriculture Research Process in Tanzania: the case of small scale farmer's participation in setting research agenda*. A scoping study repot supported under the EU funded INSARD Project.

Food and Agriculture Organization of the United Nations (FAO).(2005). *The Growing Role of Contract Farming in Agri-Food Systems Development: Drivers, Theory and Practice*, Rome, Italy

Food and Agriculture Organization of the United Nations (FAO). (2012).*Guiding principles for responsible contract farming operations*. Vialedelle Terme di Caracalla 00153 Rome, Italy

Food and Agriculture Organization of the United Nations (FAO) .(2011). *The State of Food and Agriculture: Women in Agriculture; Closing the gender gap for development*. Rome, Italy

Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society, Series A(General), 120 NO.3:253-290.*

Forsund, E., Lovell, R. C. K.,& Schmidt, P. (1980).A Survey of Frontier Production Functions and Their Relationship to Efficiency Measurement. *Journal of Econometrics 13, 5-25.*

Gardner,R. (2003).*Games For Business and Economics.2nd ed*. Leyh Publishing LLC

Gereffi, G., Humphrey, J., &Sturgeon, T. (2005).The Governance of Global Value Chains.*Review of International Political Economy*, 48(1), pp. 78-104.

Ghosh, J.,&Thorat, A. (2003). Corporate Agriculture: The Implications for Indian Farmers. Paper Presented at the all India Conference on Agriculture and Rural Society in Contemporary India, Bardhaman,17–20 December.

Gibbons, R. (2005). Four formal (izable) theories of the firm? *Journal of Economic Behavior and Organization 58, 200–245.*

Glover, D. (1990). Contract farming and out grower schemes in East and Southern Africa, *Journal of Agricultural Economics 41(3), 303-315.*

Glover, D.,& Kusterer, K. (1990).*Small Smallholders, Big Business: Contract Farming and Rural Development,* Macmillan, London.

Green,W.H. (2003).*Econometric Analysis 5th edition,* Pearson Education.

Grinnell, R.M., Unrau, Y.A. (2005).*Social Work Research and Evaluation*: *Quantitative and Qualitative Approaches 7th Ed.* Oxford University Press, New York

Grosh, B. (1994). Contract Farming in Africa: An Application of the New Institutional Economics. *Journal of African Economies, 3(2): 231-61.*

Guo,S.,& Fraser,M.W.(2015).*Propensity score Analysis. Statistical Methods and Application*: SAGE Publications, Inc.

Hart, O., & Moore, J. (1999). Foundation of incomplete contracts, *Review of Economic Studies* 66, 115–138.

Hart,O .(1995) .*Contracts and Financial Structure*. Oxford: Clarendon Press.

Hawkes,C.,& Ruel, M.T. (2011). Value Chain for Nutrition: a Paper prepared for the IFPRI 2020 International conference: 'Leveraging Agriculture for

Improving Nutrition and Health', New Delh, India

Heckman, J. (1979). Sample selection bias as a specification error, *Econometrica,* 47(1), 153-161

Heckman, J.,& Vytlacil,E. J. (2005).Structural Equations, Treatment Effects, and Econometric Policy Evaluation."*Econometrica,*73 (3): 669–738.

Henson,S.,& Cranfield, J. (2009). Building the political case for Agro-Industries and Agribusiness in Developing Countries, in Carlos da Silva et al (eds), *Agro-Industries for Development, pp 10-46,* FAO and UNIDO

Hobbs, J. E. (1996). A Transaction Cost Approach to Supply Chain Management. *Supply Chain Management, 1 (2), 15-27.*

Holland, P. (1986).Statistics and causal inference. *Journal of the American Statistical Association 81(396): 945–960.*

Humphrey, J.,& Schmitz, H. (2002). How Does Insertion in Global Value Chains Affect Upgrading in Industrial Clusters? *Regional Studies* 36(9), pp. 1017-1127

Iarossi, G (2006). *The power of survey: a user's guide for managing survey, interpreting results and influencing respondents*. Washington DC: the World Bank

Ilyas, R.M.,Banwet, D.K.,& Shankar,R. (2007). Value Chain Relationship - A strategy Matrix. Supply Chain Forum. *An International Journal*, Vol7-No2

International Monetary Fund (IMF). (2009). *Tanzania: the story of an African transition/African Dept*.; Roger Nord . . . [et al.]— Washington, D.C.

Key, N.,& Runsten, D. (1999).Contract Farming small holders, and Rural Development in Latin America. The organization of Agro processing firms and the scale of out grower production., *World Development Vol, 227*, No 2. 381 – 401

Khandker,S.R.,Koolwah,G.B.,& Samad, H.A. (2010).*A Hand book on Impact Evaluation. Quantitative methods and practices*. The World Bank, Washington,D.C

Kiluve,J., Lehmann, H., & Schmiat,C. (2002). *Disentangling Treatment Effects of Polish Active Labour Mraket Policies; Evidence from matched sample*.IZA

Institute for study of Labour. Discussion Paper no 355.

Koopmans, T. C. (1951). An analysis of production as an efficient combination of activities. In Koopmans, T. C., (Ed), *Activity Analysis of Production and Allocation*. John Wiley and Sons, Inc.

KPMG International .(2011).*Tabora, Tanzania: Potential opportunities for investment*: Retrieved 6/3/2012 from World Wide Web: http://www.kpmg.com/Global/en/WhoWeAre/CorporateCitizenship/GlobalDevelopment/Documents/tabora-potential-opportunities-for-investors.pdf

Kumbhakar, S.C., Ghosh, S.,& McGuckin J.T. (1991).A Generalized Production Frontier Approach for Estimating Determinants of Inefficiency in United-States Dairy Farms. *Journal of Business and Economic Statistics: 279-286.*

Kumbhakar, S.C., & Lovell, C.A.K. (2000).*Stochastic Frontier analysis*. Cambridge University Press, Cambridge.

Laffont,J.J., &Martimort, D. (2002).*The Theory of Incentives: The Principal Agent Model*. Princeton University Press

Little,P.D .(1994). Contract farming and the development question. In Little,P.D., Watts, M. J. (Eds.) *Living Under Contract - Contract Farming And Agrarian Transformation in Sub-Saharan Africa*(pp. 216-257). Madison, University of Wisconsin Press.

Little,P.D.,& Watts, M. J. (Eds.). (1994). *Living Under Contract - Contract Farming And Agrarian Transformation in Sub-Saharan Africa*. Madison, University of Wisconsin Press.

Lofland,J.,& Lofland, L.H. (1995).*Analysing Social Setting. A guide to Qualitative Observation and Analysis, 3rd ed.* Wadsworth Publishing Company.

Lyons, B. (1996). Empirical relevance of efficient contract theory: inter-firm contracts. *Oxford Review of Economic Policy* 12(4), 27-52.

Maddala, G. S. (1983). *Limited-Dependent and Qualitative Variables in Economics*, New York: Cambridge University Press.

Manski, C.F.,&Lerman, S.R. (1977).Estimation of choice probabilities from choice-Based samples. *Econometrica: 45 1977-1989*

Mayhew, S.,& Penny, A. (1988).*Macmillan Tropical and Sub-Tropical Foods*; Macmillan Publishers Limited; Malaysia

McCormick, D.,& Schmitz, H. (2001).Manual for Value Chain Research on Home workers in the Garment Industry. Retrieved on 11/2/2012 from World Wide Web:http://www.ids.ac.uk/ids/global/pdfs/wiegomanualendnov01.pdf

Meeusen, W.,& van den Broeck, J. (1977). Efficiency estimation from Cobb–Douglas production functions with composed error. *International Economic Review 18: 435–444.*

Minot, N. W. (1986). Contract *Farming and its effects on small farmers in less developed countries*. Food Security International Development Working Papers 54740, Lansing, MI, Michigan State University, Department of Agricultural, Food, and Resource Economics.

Miyata, S., Minot, N.,& Hu, D. (2009). Impact of Contract Farming on Income: Linking Small Farmers, Packers, and Supermarkets in China. *World Development Vol. 37, No. 11, pp. 1781–1790.*

Mizambwa,F.(2012). *Seed Production and Certification: the balance between commercial seed production and the requirements of small scale farmers.* Agricultural Seed Agency, Morogoro.

Match Maker Associates (MMA).(2008).*Sunflower Contract Farming in Arri ward, Babati district, northern Tanzania*. Article for Agr-Profocus CF seminar. Retrieved 3/3/2011 from World Wide Web http://apfcontractfarming.wikispaces.com/file/view/Case+3+MatchMaker+Sunflower+case+study.pdf.

Mount Meru Millers Limited (MMM)L. (2010). *Benefits of edible oil seeds locally planted and produced': a presentation by Mount Meru Miller Limited on behalf of local edible oil seed industry in Tanzania to the Tanzania development partners group meeting*. Retrieved September, 2013 from World Wide Web: http://www.tzdpg.or.tz mount meru millers.

Mpagalile,J.J., Ishengoma, R.,&Gillah, P. (2008). *Agribusiness Innovation in six African countries: The Tanzanian experience.* Report prepared for the World Bank Institute.

Msuya, E.,&Ashimogo, G.(2005). *Estimation of Technical Efficiency in Tanzanian Sugarcane Production: A Case Study of Mtibwa Sugar Estate Outgrowers Scheme*. Munich Personal RePEcArchive(MPRA) .Retrieved 3rd July 2012 from World Wide Web: http://mpra.ub.uni-muenchen.de/3747/

Msuya,E., Hisano, S.,& Nariu, T. (2008). *Explaining Productivity Variation among Smallholder Maize Farmers in Tanzania*. Paper presented at the XII World Congress of Rural Sociology of the International Rural Sociology Association, Goyang, Korea 2008 with the title. An Analysis of Technical Efficiency of Smallholder Maize Farmers in Tanzania in the Globalization Era.

Nankumba,J.S.,&Kalua, B. (1989).Contract farming in Malawi: Smallholder Sugar and Tea Authority. *Eastern Africa Economic Review. Special Issue. 42-58 August*

Norberg, J. (2001). *In defense of Global Capitalism.* African Liberty. Org. Cato Institute.

National Breau of Statistics(NBS) (2012). Wards Shape files. Retrieved 7th September 2013 from World Wide Web: http://nbs.go.tz/

O'Neill,S.,Metthews, A.,& Leavy,T. (1999). Farm Technical Efficiency and Extension. *Trinity Economic Paper No 12, 1999*

Oya,C. (2012).Contract Farming in Sub-Saharan Africa: A Survey of Approaches, Debates and Issues. *Journal of Agrarian Change, Vol. 12 No. 1, January 2012, pp. 1–33*

Patrick, I. (2004). *Contract farming in Indonesia: Smallholders and agribusiness working together*. ACIAR Technical Reports No. 54, 88 pp. Retrieved 7/3/2011 from World Wide Web: www.aciar.gov.au

Patton, M. Q. (2002). *Qualitative research and evaluation methods, 3rd ed*. Thousand Oaks, CA: Sage

Potentials and Limitations of Contract Farming (POLICOFA) (2010, July).*Pilot Field Survey Report* (unpublished)

Porter, M. (1985). *Competitive Advantage*. Free Press. New York

Porter, G.,&Phillips-Howard, K. (1997).Contract farming in South Africa: A case studyfrom Kwazulu-Natal.Geography*: Journal of the Geographical Association, Vol. 82(354),Jan.1997, pp.1-38.*

Prowse,M. (2012).Contract farming in Developing Countries-A Rewiew.*A Savoir NO.12.AgenceFrancaise de Development.*

Rahman,S.H.,& Umar, H.S. (2009).Measurement of Technical Efficiency and its Determinants in Crop Production in lafia Local government Area of Nasarawa State, Nigeria. *Journal of Tropical Agriculture, Food, Environment and Extension. Volume 8 number 2 pp 90 – 96*

Ramswami, B., Birthal, P. S.,& Joshi, P. K. (2005).*Efficiency and distribution in contract farming: the case of Indian poultry growers.* Discussion Paper, Indian Statistical Institute, New Delhi.

Rao,E.J.O., Brummer, B.,& Quim.M. (2012). Farmer Participation in Super market channels, production Technology and Efficiency: the case of vegetables in Kenya. *The American Journal of Agricultural Economy 94 (4):891-912.*

Ravallion, M. (2001). The Mystery of the Vanishing Benefits: An Introduction to impact evaluation. *World Bank Economic Review 15(1) 115-140.*

Raynolds, L. T. (2002).Wages for wives; Renegotiating tender and production relations in Contract Farming in the Dominican Republic. *World Development Vol. 30, No. 5 PP. 783 -798*

Reardon,T.,& Timmer, C.P. (2007).Transformation of Markets for Agricultural Output in Developing Countries Since 1950: How has Thinking Changed? In R, Evenson and P, Pingali (Eds.): *Handbook of Agricultural Economics, Volume 3.* Elsevier.B.V: Chapter55.

Ringo, I. (2013). Collaboration between Sunflower Processors and RLDC for improved Sunflower sector in Tanzania retrieved on 12/7/2013 from World Wide Web http://www.rldp.org/national-markets-development-forum/2013/processor-sand-rldc-interventions.pdf

Rural Livelihood Development Company (RLDC) (2008). *Sunflower Sector, Market Development Strategy*; RLDC, Dodoma

Rural Livelihood Development Company (RLDC). (2009). *Making Market Work for Producers*. RLDC, Dodoma

Rural Livelihood Development Company (RLDC). (2010). *Annual Report* RLDC, Dodoma.

Rural Livelihood Development Company (RLDC). (2011). Enabling Growth and raising producers incomes in the cotton sub-sector: lessons and Experience from the central Corridor of Tanzania

Rural Livelihood Development Company (RLDC). (2012). *RLDP Sunflower Sector Interventions Brief (2006-2012)*: *Brief on Project Implementation: Sunflower sector* (2006-2012); RLDC, Dodoma

Rural Livelihood Development Company (RLDC). (2012a). *Success Stories Issue No 1, 16).* RLDC, Dodoma

Rosen,S.H. (2000). *Public Finance*. 5th *ed*, Irwin/McGraw-Hill, New York.

Rosenbaum,P.,& Rubin, D. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70, 41-55*

Rosenbaum, P. (1987). Sensitivity analysis to certain permutation inferences in matched observational studies. *Biometrika, 74, 1, 13-26.*

Roy, A. (1951). Some thoughts on the distribution of earnings. *Oxford Economic Papers 3(2): 135–145.*

Ruben,R., &Saenz, F. (2008). Farmer, Markets and Contracts: chain Integration of Smallholder producers in Costa Rica. *European Review of Latin American and Caribbean Studies* 85 pp. 61-80

Rubin, D. (1974). Estimating causal effects to treatments in randomised and nonrandomisedstudies. *Journal of Educational Psychology 66: 688–701*

Rubin, D.B., &Thomas, N. (1996). Matching using estimated propensity scores: relating theory to practice. *Biometrics 52(1): 249–264.*

Sachiko, M., Nicholas, M.,& Dinghuan, H. (2007).*Impact of Contract Farming on income, linking small farmer, packers and super market in China*. IFPRI, Discussion paper no.742, International Food Policy Research Institute.

Saunders, M., Lewis, P., & Tornhill, A. (2003).*Research Methods for Business Students* Pearson Higher Education, 3rd edition, London

Schultz, T. W. (1964). *Transforming Traditional Agricultural.* Chicago: University of Chicago Press.

Shapiro,S.P. (2005). The Agency Theory, a Review in Advance. *The Annual Reviews of Sociology*: 2005.31:263-84

Singh, S. (2002).Contracting out solution: Political economy of contract farming in the Indian Punjab. *World Development Vol.30, No 9: 1621-1638*

Singh, S.(2005).*Contract farming for agricultural development: review theory and practice with special reference to India*. CENTAD, working paper no. 2, 2005, New Delhi.

SNV .(2010). *Edible Oil Seeds Value Chains development programme 2007-2015*. Result Report 2010, SNV-Tanzania.

StataCorp. (2009). *Stata Statistical Software*: Release 11. College Station, TX: StataCorp LP

Stiglitz, J. E. (1989). Rational Peasants, Efficient Institutions and a Theory of Rural Organization: Methodological Remarks for Development Economies. In: P. Bardhan (ed.). *The Economic Theory of Agrarian Institutions*. Oxford: Clarendon Press.

Tanzania Sunflower Processors Association (TASUPA) .(2013). *Katibaya Chama*. Dodoma, Tanzania.

Taylor, T.G., Drummond, H.E.,& Gomes, A.T. (1986). Agricultural credit programs and production efficiency: an analysis of traditional farming in south-eastern Minas Gerais, Brazil. *American Journal of Agricultural Economics 68, 110–119.*

Tanzania Edible Oil Actors Association (TEOSA), BEST-AC &Round Table Africa. (2012*). Assessment of the Potential of edible oilseeds produced in Tanzania: the case of sunflower and Sesame*. Research Report No. 01/2011. TEOSA.

Temu,A.E., &Temu,A.A (2005). High Value Agricultural Products for Smallholder Markets in Sub-Saharan Africa: Trends, Opportunities and Research Priorities. A Paper presented at the International Workshop on How can the poor benefit from the growing markets for high value agricultural

products?; International Center for Tropical Agriculture, Cali, Colombia.

Timmer,C.P.(1971). Using a probabilistic Frontier production Function to measure Technical Efficiency. *Journal of Political Economy, Vol.79,pp776-794*

The Tanzania National Business Council (TNBC) (2009).*Kilimo Kwanza; Towards Tanzania Green Revolution,* Dar es Salaam,

Trienekens,J.H. (2011). Agriculture Value Chain in Developing Countries, *International Food and Agribusiness Review,* Volume 14. Issue2

United Nations Industrial Development Organization (UNIDO). (2009*).Value Chain Diagnostics for Industrial Development: Building blocks for a holistic and rapid analytical tool*. UNIDO Working Paper, Vienna.

United Nations Industrial Development Organization (UNIDO) (2011). *Pro-poor Value Chain Development: 25 guiding questions for designing and implementing agro industry projects.* Vienna, Austria.

United Republic of Tanzania (URT).(2002).*Small and Medium Enterprise Development Policy*. Ministry of Industry and Trade, Dar es Salaam.

United Republic of Tanzania (2003). *National Trade Policy: Trade Policy for a Competitive economy and Export-Led Growth*: Ministry of Industry and Trade, Dar es Salaam

United Republic of Tanzania (2003a). *The Tanzania Food, Drugs and Cosmetics ACT*. Government Printer, Dar Es Salaam

United Republic of Tanzania (2007a). *National sample census of Agriculture 2002/2003;* Dodoma Region

United Republic of Tanzania (2007b). *National sample census of Agriculture 2002/2003*; Singida Region

United Republic of Tanzania 2008). *The Economic Survey, 2007*. The Ministry of Finance and Economic Affairs Dar Es salaam, retrieved on 6/6/2011 from World Wide Webhttp://www.tanzania.go.tz/economy.html

United Republic of Tanzania (2009). *Poverty and Human Development Report 2009*.Dar es Salaam, Ministry of Finance and Economic Affairs

United Republic of Tanzania (2009a). *Kilimo Kwanza;* Dar es Salaam

United Republic of Tanzania (1999b).*The Tanzania Development Vision 2025*: Planning Commission, President Office, Dar es Salaam

United Republic of Tanzania (2010). *The Economic Survey 2009*: The Ministry of Finance and Economic Affairs Dar Es salaam, retrieved 6/6/2011 from World Wide Web http://www.tanzania.go.tz/economy.html

United Republic of Tanzania (2011). *The Economic Survey, 2010*. Ministry of Finance, Dar es Salaam

United Republic of Tanzania. (2011a), *Review of the Dodoma Capital City Master plan:* Technical Supplementary Report Vol.1 Planning Studies.

United Republic of Tanzania (2011b) .*The Tanzania Five Year Development Plan 2011/2012-2015/2016.* Planning Commission, President's office, Dares salaam.

United Republic of Tanzania (2012). *Integrated Policy Approach to Commercializing Smallholder Maize Production*. A policy paper presented at FAO-University of Nairobi: Regional Workshop, Nairobi. Ministry of Agriculture, Food Security and Cooperative

United Republic of Tanzania (2012a). *The Tanzania Long-Term Perspective Plan (LTPP), 2011/12-2025/26 The Roadmap to a Middle Income Country*. President's Office, Planning Commission, Dar es Salaam

United Republic of Tanzania (2013). *Kongwa District Council*. Local Government Directory/2013/14: ALAT Handbook.

United Republic of Tanzania .(2013a).*2012 Population and Housing census: Population Distribution by Administrative Areas*. NBS, Dare es Salaam and Office of Chief Government Statistician President's Office, Zanzibar

United Republic of Tanzania .(2013). *Iramba District Council*. Local Government Directory/2013/14: ALAT Handbook.

United Republic of Tanzania .(2013b).*The Economic Survey 2012*.Ministry of Finance. Dar Es Salaam

United Republic of Tanzania /FAO. (2008). *Agricultural Sector Reforms in Tanzania; Perspective from within:* Ministry of Agriculture Food Security and Cooperatives in collaboration with FAO.

Venetoklis,T.(2004). *An evaluation of wage subsidy programs to SMEs utilizing propensity score matching.* Helsinki, VATT, Valtiontaloudellinentukkimuskeskus, Government Institute for Economic Research,(B,ISSN 0788-5008,NO,106), ISBN 951-561-480-5).

Walsh, M. (2001).Research *Made Real; a guide for students*. Nelson Thornes Ltd,

Warning, M.,&Hoo, W. (2000).*The Impact of Contract Farming on Income Distribution: Theory and Evidence.* Paper Prepared for Presentation at the Western Economics Association International Annual Meetings June 30, 2000.

Warning, M.,& Key, N. (2002).The Social Performance and Distributional Consequences of Contract Farming: An Equilibrium Analysis of the Arachidede Bouche Program in Senegal. *World Development 30, (2) pp. 255-263*

World Food Programme (2010).*Realizing a new vision for agriculture*: A road map for stakeholders', Geneva. Retrieved on 5/8/2013 from World Wide Webhttp://www3.weforum.org/docs/WEF_IP_NVA_Roadmap_Report.pdf

World Food Programme (WFP) (2013). *Comprehensive Food Security and Vulnerability Analysis (CFSVA), Tanzania, 2012* Via C.G. Viola 68, Parco de' Medici, 00148, Rome, Italy

Will,M.(2013). *Contract farming handbook.A practical guide for linking small-scale producers and buyers through business model innovation*. Bonn and Eschborn: Deutsche Gesellschaftfür Internationale Zusammenarbeit (GIZ) GmbH.

Williamson, O. (1996).*The Mechanism of Governance*. Oxford: Oxford University Press.

World Bank. (2001). *World Development Report 2002: Building Institutions for Markets*. Washington DC: The World Bank.

World Bank. (2007).*Agriculture for development*: World Development Report 2006. Washington DC: The World Bank

Wu, S. (2006). Contract theory and agricultural policy analysis: a discussion and survey of recent developments. *The Australian Journal of Agricultural and*

Resource Economics, 50,: 490–509

Wu, S.,& Roe, B. (2007). Contract enforcement social efficiency and Distribution: some experimental evidence. *American Journal of Agricultural Economics 89(2), 243-258.*

Xie,Y.,& Manski, C.F. (1989). The logit model and Response Based Samples. *Sociological Methods and Research Volume 17.No.3 283-302.*

APPENDICES

APPENDIX I

Table 4.3 Maximum Likelihood Estimates of the parameters for Treatment Effect Model of Income source

Variable	Coef	Robust Std. Error.	Z| P>|z|
Outcome equation:			
Dependent Variable: *INCOME (Per capita household income)*			
Age of household head (in years)	-2713.9	1525.4	--1.78*
Age squared of household head(in years)	27.8	16.6	1.68*
SEX of a household head (1 if woman and 0 otherwise)	-3520.7	8683.6	-0.41
Household size (in persons)	-7503.4	3979.3	-1.89*
Proportion of adults in the household	56.0	214.0	0.26
Education2(1 if primary education and 0 otherwise)	11780.8	13036.5	0.90
Education 3 (1 if secondary education and 0 otherwise)	14817.7	24887.5	0.60
Experience (years growing sunflower)	-3100.4	1703.3	-1.82*
Having a bank account	-5178.4	18758.0	-0.28
Means of saving2 (1 if f/institutions/saccos, and 0 otherwise)	-5177.3	21259.6	-0.24
Means of saving3 (1 if buying assets/crops, and 0 otherwise	13327.0	10317.9	1.29
Household land endowment(in acres)	4322.7	2867.3	1.51
$Per\ capita_{land}$ (Land endowment per household members	-8905.1	12950.0	-0.69
Non-agricultural asset value in Tshs	.0006	.0003	1.93**
Contract (contract participation)	-6124.5	30773.9	-0.20
Constant	131854.8	55761.1	2.36**
Selection equation:			
Dependent variable: *Contract Participation Dummy*			
Age of household head (in years)	-.0236	.0336	-0.70
Age squared of h/head	.0003	.0003	1.11
SEX of a household head (1 if woman and 0 otherwise)	-.0381	.1590	-0.24
Household size (in persons)	.0223	.0552	0.40
Proportion of adults in the household	-.0015	.0038	-0.39
Education2(1 primary education, 0 otherwise)	.2733	.1664	1.64
Education 3 (1 secondary education, 0 otherwise)	.7445	.5668	1.31

Experience (years growing sunflower)	-.0019	.0246	-0.08
Having a bank account	-1.307	.3892	-3.36***
Means of saving2 (1 if f/institutions/saccos, 0 otherwise)	-.4949	.3548	-1.39
Means of saving3 (1 if buying assets/crops, 0 otherwise	.3648	.1326	2.75***
Household land endowment(in acres)	-.0233	.0235	-0.99
$Per\ capita_{land}$ (Land endowment per household members	.1634	.1422	1.15
Non-agricultural asset value in Tshs	-1.20e-08	8.95e-09	-1.33
Village1 (1 if village, 0 otherwise)	.6340	.2342	2.71***
Village2 (1 if village 2, 0 otherwise)	.6922	.2164	3.20***
Village3 (1 if village 3, 0 otherwise)	.6358	.2192	2.90***
Village4(1 if village 4, 0 otherwise)	.2867	.3355	0.85
Village5 (1 if village 5, 0 otherwise)	.3593	. .2871	1.25
Village6 (1 if village 6, 0 otherwise)	-.2258	.2381	-0.95
Village7(1 if village 7, 0 otherwise)	-.3663	.2575	-1.42
Constant	.9980	1.132	0.88
Athrho	.1461	.2259	0.65
Rho	.1451	.2211	
Number of observation	400		
Wald chi2(15)	30.5	Prob > chi2 = 0.0103	
Log Pseudo likelihood	-5202.2		
Wald test of independence of equations. (rho = 0):	chi2(1) =	0.42Prob > chi2 = 0.51	

***, **, and * represent significance at 1%, 5% and 10% levels respectively.

Appendix II

Primary data survey questionnaire

EHNANCING PRODUCTIVITY, MARKET ACCESS, AND INCOMES TO SMALLHOLDER FARMING BUSINESS IN TANZANIA (POLICOFA)

CHUO KIKUU MZUMBE

RESEARCH ON CONTRACT FARMING IN TANZANIA FOR SUNFLOWER, TOBACCO, SUNFLOWER, AND SUGARCANE

Questionnaire for Sunflower contract farming

SECTION A-1: IDENTIFICATION PARTICULARS

1. Region:……
2. District:……
3. Ward:……
4. Village:……
5. Village chairman:……
6. Household Number in the Village Register:……
7. Head of household's name:……
8. Household size:…… below 18……18_65……above65……
9. Survey month and year:……

Field Data Monitoring

S/No.	Data	Details
1.	Name of Interviewer	
2.	Interviewer number	
3.	Interview start time	
4.	Date of interview	
5.	Name of Supervisor	
6.	Supervisor's number	
7.	Date questionnaire inspected	
8.	Name of Data entry clerk	
9.	Data entry clerk's number	
10.	Data entry date	
11.	Data submission date	
12.	Data file approval date	

SECTION A-2: HOUSEHOLD ROSTER

	1. NAME List household members starting with head of household in	2. Sex M…1 F….2	3. Age Years	4. Education No school……..…..1 Some primary…… 2 Completed primary…….. 3 Some secondary…4	5.Occupation Agriculture…1 Fishing……2 Mining……3 Masonry…….4	6. Marital Status Married…...1 Separated…2 Divorced….3 Never
1.						
2.						
3.						
4.						

SECTION B -1 CROP SPECIFIC- PLANTING AND HARVESTING

8. Was area harvested equal to area planted? Yes…….1 No…….2	10. If NOT What were the reasons that it was less than the area planted? Drought……1 Effects of rain.....2 Fire……3 Insects……4 Animals……5 Crop theft……6 Diseases & community problems……7 Lack of casual labour……8 Factory capacity……9 Other (specify)……10	11. How may bags/kilos of [crop] did you harvest per acre last season?	12. What was the total harvest in kilos/bags last season on	13. How much harvest was worth marketing during harvest season? (Estimated amount/value of the harvested crop)	14 How much harvest was used at home KGs.

13. Do you store the crop after harvest, before selling?	14. What is your main method of storage?	15. What is usually the main purpose of storing it?
YES…….1 NO…….2	Traditional Storage (Vihenge)……..1 Improved Locally……..2 Village Warehouse……3 PCs Warehouse……4 Sacks/Open Drum…….....5 Airtight Drum Unprotected…… 6 Pile……7 Other (specify)…… .8	Food For Household……1 To Sell At Higher price……2 Seed For Planting……..3 Other (specify)……4

SECTION B-2: CROP SPECIFIC- SALES							
1. Did you sell the crop produced in the last season? YES……..1 NO……...2	2. What was the quantity sold? KGS/Bags	3. What was the price per Kilo/Bag? TSH	4. What was the total value of the sale? TSH.	5 What was the methods of selling Personally looking for buyers…..1 Taking the produce to the market……..2 Selling to marketing cooperatives..3 Other (mention)…..	6. How many buyers this season One…….1 More than One…….2	7. When was the relationship established? Less than a week……1 Less than a month……2 A month ago…….3 Six months ago……..4 One yerar ago……..5	8. Are buyers residents or visiting? Resident..1 Visiting…2

7. Where do the visiting buyers come from?	8. Have there been changes from previous season? YES…1 NO….2	9. What are the changes? Explain. Increased number of visiting buyers…1 Increased number of local buyers…	10. How is quality of the crop assessed/determined? Laboratory testing…..1 Physical looking….2 Historical production of a crop….3	11. Who does the grading of the crop? Farmer….. Sponsor Special grader… Other (specify..4	12. What things does the price offered depend ON? Quality.1 Quantity..2 Time……3 Other ….42	13. Did you transport crop for sale? YES…1 NO….2	14. What is the average distance you transported for sale? 0-5KM..1 6-10KM….2 11-15KM…3 16-20KM…4 KM

15. How did you transport crop? On Foot……..1 Bicycle……2 Animal……3 Animal cart….4 Car…….5 Other (Specify)….6	16. Who pays costs of transport? Farmer…….1 Buyer……2 Cooperative Union/Intermediary...3 Other(specify)…….4	17. How much does it cost? TSH.	18. What are the payment mechanisms? Deducted from sales…1 Cash on uploading.....2 Cash on delivery……3	19. What is the payment principle? Volume……1 Truck……2 Distance……3

20. Did you encounter any crop loss during the last harvest? YES…….1 NO……..2	21. What were the reasons for the loss? Rotting……1 Insects……2 Rodents……..3 Pests……4 Theft……5 Fire……..6 Weather (Rain, Wind etc.)……..7 Other (Specify)……8	22. What was the estimated value of this lost crop? TSH.

SECTION C-1:OTHER CROPS PRODUCED				
1. List by ranking all other important crops you cultivated last year? CROP NAME SIZE/ Acre.	2. How much did you harvest in each crop? KGS	3. What was the sales price per kilogram? TSH.	4. What was the total revenue obtained from sales? TSH	5. What was the total cost of operations/production and harvesting? H.

SECTION C-1: INPUTS USED LAST SEASON					
1. How much inputs were used in the last season?		2. How much did the inputs cost in total? Tshs		3. How much input did you use per acre? kg.	
Seeds		Seeds		Seeds	
Organic fertilizer		Organic fertilizer		Organic fertilizer	
Inorganic fertilizer		Inorganic fertilizer		Inorganic fertilizer	
Pesticides/Herbicides		Pesticides/Herbicides		Pesticides/Herbicides	

4. From whom did you purchase/obtain these inputs? Cooperative…1 Stockist……2 Trader……..3 Contractor..…4 Other……5 Private sellers of local manure..6	5. How was the inputs used? For the intended crop…….1 Together with another crop(s)..2	6. Were the inputs supplied used during the farming period? Yes…1 No….2	7. What type of seed did you use last season? Hybrid….1 Local….2	8. Where did you obtain your seeds? Purchased from seed stockists…..1 market…....2 contractor...3 cooperatives4 from previous harvest…..5	9. Why didn't you use hybrid seeds(improved seeds) Lack ofFunds..1 Lack of Seeds..2 Not necessary…..3	10.

SECTION C-3: INPUTS ON CREDIT

1. Did you receive the following inputs on credit for the planted plots during the last season? YES……..1 NO……...2		2. Who determines volume and types of inputs used? Buyer……1 Farmer…….2 Intermediary……3 According to agreement….4 Other (specify)……5	4. How much did you receive? INPUT KGS/LITRE		5. What is the unit price for the inputs? TSH.		6. How much did you pay upfront for these inputs? TSH.
Seeds			Seeds		Seeds		
Organic Fertilizer			Organic Fertilizer		Organic Fertilizer		
Inorganic Fertilizer			Inorganic Fertilizer		Inorganic Fertilizer		
Pesticides/Herbs			Pesticides/Herbs		Pesticides/Herbs		

SECTION C-4: VOUCHER PAYMENT SYSTEM

1. Did you receive government voucher to purchase any inputs in the last 12 months?	2. What type of voucher did you receive? List all that apply Fertilizer….1 Seeds……2 Pesticides….3	3. When did you receive the voucher? MONTH	4. Have you redeemed the voucher? YES…….1 NO…….2	5. Where did you redeem the voucher?	6. How much did you pay in cash for the inputs covered by the voucher? TSH.	7. How useful was the voucher system to you?Very useful…..1 Useful…….2 Fairly useful….3

7. How much did you repay in cash later on for the inputs? INPUT TSH.		8. How did you pay? Direct Deductions From Sales…… ……....1 Payment to group Leaders……2 Payment direct to Bank……3	9. How much in total did you pay for the inputs? TSH.	10. From whom did you receive these inputs on credit? Contractor……..1 Stockist…… ……..2 Cooperative/Association…3 Trader…… 4 CROP BOARD…….5 Other (Specify)…… 6
Seeds				
Organic Fertilizer				
Inorganic Fertilizer				
Pesticides/Herbs				

8.	9.
Where did your household hire an item in the last agricultural season? Individual owner in the village……1 Farm inputs lenders……2 Government agriculture centres……3 CONTRACTOR……4	How much did your household pay to hire the mentioned item(s) in the last agricultural season? TOTAL TSH.

HIRED LABOUR CONTINUE					
LAND PREPARATION AND PLANTING		WEEDING		HARVESTING	
MAN DAYS	TOTAL WAGE PAID (TSH.)	MAN DAYS	TOTAL WAGE PAID (TSH.)	MAN DAYS	TOTAL WAGE PAID (TSH.)

SECTION D: SOURCE OF LABOUR				**HIRED LABOUR**
	1. During the last cropping season, how many days did household members spend on the following activities?			2. Did you hire any labour to work on this crop in the last season?
LIST HOUSEHOLD MEMBERS HERE	Land preparation & planting (DAYS)		Weeding (DAYS) Harvesting (DAYS)	YES……1 NO…….. 2

SECTION F: EXTENSION SERVICES			
1. Did you receive any agricultural advice in the last production season? YES…….1 GO QN 2 NO……..2	2. What type of agricultural advice did you receive? Cultivation……1 Marketing…….2 Prevention of crop disease……..3 Sorting……..4 Grading……5 Storage……..6 Transport……..7 All the above……8 Other (specify)……	3. Where did you mostly receive the agricultural advice from? Government ……..……1 Cooperatives……..2 Farmers Association……..3 Buyers/Traders…..……4 Small scale farmers network….5 Experienced farmer……..……6 Relative (s) within family…….7	4. Did you receive the said agricultural advice timely? YES……1 NO…….2

5. How would you rate the advice received? GOOD……..1 AVERAGE……..2 UNSATISFACTOR ...3	6. Did you pay anything in order to receive the advice? YES…..1 Go to QN 7 NO….2 Go to QN 8	7. How much did you pay? (TOTAL COST REQUIRED HERE) TSH.	8. Why didn't you pay anything? Part of the contract..1	9. How often did you receive extension services in the last season? Once…….1 Twice……2 Thrice……...3 More than three times…….4 Put "0" if never	10. Have there been changes in extension service provision over the last 12 months? YES…..1 NO…..2	11. What have been the changes? Explain.

12. Did you receive information on agricultural production and marketing in the last season? YES……..1 NO……2	13. What type of information did you receive? Price……1 Farm inputs…….2 Market……..3 Group networking……4 Credit…….5	14. Where did you mostly receive information on agricultural production and marketing? Government ……1 NGO……..2 Cooperatives……3 Farmers Association(s)……...4 Large scale farmers…….5 Neighbour……6 Trader……7 Contractor……....8 Internet…….. ..9	15. Did you pay anything for the information you received? YES……1 NO…….2	16. How much did you pay? TSH	17. If NO, who paid?

SECTION G: CREDIT

1. (a)Over the past 12 months, did you or anyone else in this household borrow from someone outside the household or from any financial institution?

YES……. 1 ☐

NO…….. 2

(b) If No in (a) above, why?

	2. What are the names of the persons or institutions from whom you or anyone else in your household took credit/borrowed? LIST ALL PEOPLE OR ORGANIZATIONS BEFORE	3. Which household member was responsible for the loan? ID CODE	4. Was this a cash loan or goods on credit? CASH…1 GOODS..2	5. How much was borrowed or what was the value of credit? TSH.	6. Is the loan repaid? YES….1 NO….2	7. Approx. when do you expect to pay back the loan? M YY		8. Total amount to be paid on the loan including interest TSH.	9. What did you use the loan for? CODES SEE BELOW TABLE
1									
2									

10. What is the main source of your farming activity finance? Own savings……..1 Borrowing……..2 Both…….3	11. Do you own a bank account? Yes1 No…..2	12. Why don't you have a bank account? No enough cash to save……..1 No banking service nearby….2 Not aware of the importance of a bank account…….3	13. What are your means of saving? Through local village groups……1 Through Saccos…….2 Through buying of assets…..3	14. . Are you credit constraint? Yes…1 No….2	15. If yes, did you receive any loan during the last season Yes ……..1 No……2

16. How much money was borrowed?	17. Was this loan enough? Yes……1 No…….2	18. Like how much money would have been enough loan?	19. Were there conditions in obtaining loans? Yes…….1 No……..2	20. What were conditions of loans Age limit……1 Collateral……2 Guarantee ship….3 Loan amount……4 Interest rate……..5 Repayment period….6 Farm size……..7 Type of crop…….8

SECTION H: OUTGROWER SCHEMES & CONTRACT FARMING

21. How do you rate these conditions About right……..1 Harsh…….2 Too harsh……..3 Much too harsh……4	22. What did you DO with the loan? Purchase land……1 Purchase agro- inputs…….2 Purchase/hire agro machinery……3 Subsistence needs……4 Ceremony/wedding……5	23. How do you pay your loan? By direct deductions from sales……1 By paying cash through banks….2

1. Did you cultivate [CROP] as part of contract farming system at any time over the last 12 Yes…1 No…2. ☐

2. If NOT, why are you not in contract farming?
   a. Don't know about CF☐
   b. Difficult conditions of CF☐ ☐
   c. Don't trust companies/agents in CF☐
   d. Dislike contracts☐

3. What was the reason for you entering in contract farming?	4. What was the type of contract you entered?	5. How many acres are under contract farming system?	6. What did you agree in advance with the buyer as part of this scheme? Tick as many as possible	7. Would you say that the buyer complied with the original agreement?
Lack of inputs……...1 Market access……...2 Credit access…….3 Extension services.4 All The above….5 Other (Specify)…..6	Written…….1 Verbal…..….2	ACRES	Crop Sale Price……1 Amount you produce……..2 Area to be planted……3 Quality of crop…….....4 Date of harvest…….5 Inputs to be used (e.g. Seed Variety, Fertilizer, Pesticide)…….……6 All the above……7 Other……..8	YES……1 NO…….2

8. What were the main problems lead a buyer not complying with the contract? Did not buy all crop……1 Delays in payment……..2 Changed price…….3 Quality low……..4 Other…….5	9. Would you say that you complied with the original agreements? YES……1 NO…….2	10. What were the main problems that lead you (a farmer) not to comply with the contract? Sold elsewhere…1 Planted less……2 Produced less……3 Did not meet required Standard.4	11. How do you handle conflicts in case of contract breach? Negotiations…..1 Mediation……..2 Reconciliation...3 Arbitration…….4 Other (specify)..5

13. What are the enforcement mechanisms if the contract is breached? Individual……1 Court…… 2 Outside court……3 Farmer groups……4 Cooperatives…..5	14. Does the enforcement mechanism work? YES…..1 NO…..2	15. Is there any exit or termination of contract clause for both parties? YES…..1 NO…...2	16. What are the criteria for participation in contract farming arrangement? Group formation….1 Membership in Cooperative Unions...2 Farm size……..3 Residence……4 Other……..5	17. Do you belong to any farmer group? YES.1 NO…2	18. How do you benefit from the group?	19. What is the group size?

20. How long have you been in the farmer group? One Year.1	21. How many times have you particip ated in contract farming for the last past 5 years? Onc.1	22. What are the organizations/associat ions dealing with promotion of contract farming in your area? Private companies (mention them)……1 International organizations…2 Local Government Authority…….3	23. What are the roles of the institutions you have mentioned regarding to contract farming? Provision of extension services.1 Inputs on Credit…..2	24 . Do you think you really need contracti ng farming scheme?	25. Are you willing to continue with CF? Yes…….1 No……..2

Two Years 2 Three Year …3 Four Year …4	Twice2 Thrice3 Four times… 4 Five times… 5 More than 5 times.6	Individuals…….4 Tobacco Buyers…….5 Financial Institutions……6 Other (specify)……..7	Farmer group formation. 3 Contract negotiation skills…4 Market informatio n..5	Yes….1 No….2	

SECTION I-1: WAGE JOBS				
1. Did you do any wage work during the last 12 months? YES……1 NO……2	2. Who was an employer for the work?	3. Do you receive wages, salary or other payment in cash or kind YES……1NO……2	4. What is the main reason for receiving no payments? Volunteer……1Compensation scheme….2	5. How were you paid? CODE TSH

26. What problem (s) do you face regarding [crop] production and Marketing?[tick the correct ones]

i. High price of seeds□

ii. Poor quality of seeds□

iii. High production cost□

iv. High marketing cost□

v. Unreliable market □

vi. Unreliable weather □

vii. Delayed payment □

viii. Lack of inputs□

ix. Disease □

x. Poor infrastructure □

xi. Lack of market information □

xii. Increased competition level against competing commodities. □

xiii. Low fertility of soils□

Other_____

SECTION I-2: SELF EMPLOYMENT			
1. Did you operate any business activity in the last year other than agriculture? YES…….1: NO…….2	2. What kind of business do you operat Fishing……1 Mining……2 Carpentry……..3 Masonry……..4 Petty business…5 Other (specify)6	3. How much income do you earn per DAY/MONTH/YEAR from your business? DAY MONTH YEAR	4. How much were the operating costs related to your business? TSHS.

SECTION J ASSETS AND WEALTH			
1. Type of house owned 1.Roofing: Corrugated iron sheet…1 Grass thatched…….2 2.Floor: Concrete……..1 Earth……...2 3.Wall Burnt bricks……1 Cement blocks……2 Mud and trees…….3 Un burnt bricks……4	2. Agricultural Assets Tractor……1 Plough……2 Wheelbarrow……3 Cart……4 Hoe……5 Other ……..	3. Non Agricultural Assets Car……..1 Motorcycle……2 Livestock……...3 Television……..4 Radio……..5 Bicycle ……..6	
Estimated Money Value	**Estimated Money Value**	**Estimated Money Value**	
TSHs	**TSHs**	**TSHs**	

Appendix III

Value chain survey questionnaire
INTERVIEW GUIDE-
PROCESSORS
Name of the Company……Date……
Owner of the company…. (Individual, Partnership, Cooperative)
Date/Year started…….. Location……. Tbs…….Tfda……..Bar code…….
Company's core activities……
Type of machines and their capacities vs. actual performance
How do you obtain sunflower for your firm?
From own farms…..%
From contract……%
From spot markets……. %
How do you explain demand and supply of sunflower oil seeds
When and how did you start Contract farming (What was the role of your company in designing and implementation of CF?
Number of smallholders involved; geographical coverage
What are selection criteria for joining contracts (volume, size of landholding, area planted, quality, membership in farmers group?)
How do you address issues of price determination, quality concerns, volume of seed sunflower, volume and types of inputs, repayment terms, provision of other services)
Which services are provided (inputs, extension, transport, grading, and land preparation)…..
How do you finance your operations or activities?
What are Contract enforcement procedures (including the role of DC, ward and village executive officers and task force, the company itself Formation of Farmers) what do you do to build trust and avoid raising unrealistic expectations of farmers.

Which aspects of the contract have been easy to handle
Which aspects of the contract have been difficult to handle
- Assistance from others
- Who
Influence on contract formulation (council, companies, and municipality?)
Understanding of the contract by members – need for explanations

Whether/how the contract(s) address problems such as side-marketing, production risk, discrimination
Any changes in contract and reason
Determination of volume and types of inputs used (processor, smallholder, according to agreement/contract)
Delivery of inputs from processor (supply system and organisation)
Repayment terms (deducted from sale; cash)
Repayment rates (2009-2012)
What is the risk of you engaging in contract?
What makes or breaks contract?

What are success and challenges that are associated with CF Programme as seen from your perspectives
Are you willing to continue with CF activities? Why?

Purchasing strategies, including:
Price determinants (is price depending on quality)
Quality determinants and assessment
Organisation of buying outlets (own staff / buying agents / FBGs)
Organisation and terms of payment

Marketing of processed products
i. Concentration in domestic market.
a. Number and type of buyers
b. Continuity of buyer-supplier relationships
c. Average size of orders from buyers
d. Use of written sales contracts (if relevant)
e. Level and stability of the price received (is it fair?)
f. Knowledge about quality demands and other buyer requirements
g. Degree of compliance with buyer demands (volume, quality, and timing)
h. Buyer 'satisfaction' with suppliers
ii. Market expansion, reaching the regional markets
a. Promoting domestic market and reaching the regional market
b. Creating a common export desk serving farmer groups or individually?
c. Any sales contracts?
iii. Market deepening, upgrading for both domestic and regional and international market
Check list:
History of the firm
Current activities and products
Organisation and management
Firm capabilities
Supply and marketing chain
Export
Challenges
Contracts and challenges
Recent development
Development agenda
INTERVIEW GUIDE:

ASSOCIATION &NGOs (TEHOSA, CEZOSOPA, RLDC)
Name of the Association…….Date of interview…….
Date/Year started…….. Location…….

Association's core activities……

1. What type of members in this association? Which barriers to entry exist (e.g. required capacities and investments, economies of scale, membership in.., licenses?

What rules and regulations exist determining the functioning of the association? What is the impact of these rules and regulations on members in the association and its overall performance? Association?
What are the common practices of communication and information exchange in the chain?
What is the level of trust among the actors within and across the various stages of the value chain?
What types of horizontal coordination mechanisms exist between members (partnerships, joint-ventures, cooperation agreements)?
• Number of well-functioning producers or processors in the association
• Participation of poor actors in these groups
• Degree of stability of groups
• Volume of products handled by the individual producer
Indicators on value chain development, Status of value chain development (quality, Process, standards compliance, volume, timing of supply, inter-chain, etc.)
• Competences of main actors in the value chain in relation to the degree of development of the value chain development.
The role and whether has any backward or forward linkages?

Production issues
Volume extension:
Increasing the amount of product sold through increased yield or area in agricultural production, any knowledge/linkage to contract farming?
Extension of processing capacities and the appropriateness of skills and technology. Issues of efficiency, effectiveness, affordability, and of compliance with standards,. Delivering on schedule, proper invoicing, improving client management, reducing wastage. Any training, advice?

Issue of value addition and how is distributed among different processors. How members are moving into 'high-value markets', by complying with buyer requirements for physical quality, certification, and food safety standards, Innovative capacities of various actors to search for and use new knowledge and technologies? for traceability, packaging etc number of actors across

Market issues
1. How do you explain the appropriateness of quantity and quality of produce?
2. How do you explain the market (domestic, regional, and international?)
3. What is the role of your association in promoting, markets?
Concentration in domestic market.
Number and type of buyers
Continuity of buyer-supplier relationships

Average size of orders from buyers
Use of written sales contracts (if relevant)
Level and stability of the price received (is it fair?)
Knowledge about quality demands and other buyer requirements
Degree of compliance with buyer demands (volume, quality, timing)
Buyer 'satisfaction' with suppliers
Market expansion, reaching the regional markets
Promoting domestic market and reaching the regional market
Creating a common export desk serving farmer groups.
Market deepening, upgrading for both domestic and regional and international market

Policy issues
How do you explain the institutional and regulatory for production and marketing of sunflower (seed oil) produce? Compliance with tbs, tfda standards
Past attempts to improve business environment and their impact on identifying constraints and opportunities for the future.

Challenges
Competition
Infrastructure
Quality
Regulatory weakness/ taxes, levies and fees
Cost of power/ operation
Access to capital

Views on contracts
Advantages of contract system (why)
Disadvantages of contract system (why)
Its influence on contract
Understanding of contract by members – need for explanation

INTERVIEW GUIDE:
STATE INSTITUTIONS (TBS, TFDA, MINISTRY OF AFRICULTURE)
-Roles, functions, and challenges in relation to contract farming system, technology, production and marketing of edible oil