

**CONTRACTUAL ARRANGEMENTS AND SMALLHOLDER CANE
GROWERS' PERFORMANCE: EVIDENCE FROM KILOMBERO AND
TURIANI, MOROGORO - TANZANIA**

**CONTRACTUAL ARRANGEMENTS AND SMALLHOLDER CANE
GROWERS' PERFORMANCE: EVIDENCE FROM KILOMBERO AND
TURIANI, MOROGORO - TANZANIA**

By

Thobias Edward Nsindagi

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

2015

CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a thesis entitled **Contractual Arrangements, Efficiency and Income Diversification Strategies in Tanzania: Evidence from Kilombero and Turiani Smallholder Cane Growers**, in fulfillment of the requirements for award of the degree of Doctor of Philosophy of Mzumbe University.

Major Supervisor

Internal Examiner

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

DIRECTOR

**DECLARATION
AND
COPYRIGHT**

I, Thobias Edward Nsindagi, declare that this thesis is my own original work and that it has not been presented to any other university for a similar or any other degree award.

Signature _____

Date _____

©

This thesis is a copyright material protected under the Berne Convention, the Copyright Act 1999 and other international and national enactments, in that behalf, on intellectual property. It may not be reproduced by any means in full or in part, except for short extracts in fair dealings, for research or private study, critical scholarly review or discourse with an acknowledgement, without the written permission of Mzumbe University, on behalf of the author.

ACKNOWLEDGEMNT

It is time now to express my gratitude to all who were involved in one way or another to make this journey successful. My first and foremost appreciations are extended to the POLICOFA project coordinator, Professor Joseph A. Kuzilwa, for encouraging me to write a concept paper as an initial process towards enrollment into a PhD programme at Mzumbe University through POLICOFA project.

I am also deeply indebted to my supervisors at Mzumbe University and University of Copenhagen, Dr. Jennifer Sesabo and Professor Niels Fold, respectively for their professional guidance, inspiration, encouragement and cooperation throughout the study period. Many thanks should also extend to Professor Arne Henningsen, Professor Mariane Larsen, Dr. Lotte Isager and Professor Jeans-Martin from University of Copenhagen for their tireless efforts in guiding me, and shaping my work.

The completion of this thesis would have been impossible without financial support from Danida Fellowship Grant which covered all study expenses including travelling and accommodation in various places in Copenhagen – Denmark. Special thanks are extended to the Danida Fellowship Center (DFC) staff: Ms. Eva Thoulow and the team who deserve special thanks for organising, taking care, and making life easy during our stay at DFC and Hotel Stay in Copenhagen. I am also grateful to the staff from the Department of Geography and the Institute of Food and Resource Economics (University of Copenhagen) for offering me academic resources during the periods I stayed in Copenhagen.

I would also like to acknowledge my research assistants, Mr. Felician B. Augustino, Tumaini Longishu, Furahini Kibanga, and Getzaina Kikoti for their hard work, tolerance, and willingness to work for long periods under difficult conditions during the period of data collection. Finally, I extend my special thanks to my wife and all family members for creating a conducive environment for me to concentrate on my studies by undertaking complete responsibility in taking care of our children.

DEDICATION

This thesis is dedicated to my wife, Caroline Nsindagi; my children, Leticia, Tedy, Rosemary, Faith, Ezekiel, and Erick; my father, Edward Nsindagi; and the memory of my late mother, Halwen Nyogonya. The design, implementation and completion of this thesis are a sign of your tolerance of loneliness.

LIST OF ABBREVIATIONS AND ACRONYMS

ABDI	Asian Development Bank Institute
ASDP	Agricultural Sector Development Programme
ASDS	Agricultural Sector Development Strategy
BSGA	Bonye Cane Growers Association
CAADP	Comprehensive African Agriculture Development Programme
CBOs	Capacity Building Organisations
CF	Contract Farming
CRDB	Cooperative and Rural Development Bank
DEA	Data Envelopment Analysis
DFC	Danida Fellowship Centre
DRD	Daily Ratable Delivery
EU	European Union
FAO	Food and Agriculture Organisation of the United Nation
FEJ	First Expressed Juice
GDP	Gross Domestic Product
GLOBALGAP	Global Good Agricultural Practices
GRN	Growers Registration Number
GVC	Global Value Chain
IFPRI	International Food policy Research Institute
KCGA	Kilombero Cane Growers Association
KSCL	Kilombero Sugar Company Limited
MACGA	Maendeleo Cane Growers Association
MAFC	Ministry of Agriculture and Food Security
MCGA	Msindazi cane Growers Association
MGB	Mill Group Board
MLE	Maximum Likelihood Estimation
MMT	Million Metric Tons
MOA	Mtibwa Outgrowers Association
MoU	Memorandum of Understanding

MRCO	Morogoro Region Commissioner's Office
MSEL	Mtibwa Sugar Estate Limited
MUCGA	Muungano Cane Growers Association
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NaSARRI	National Semi Arid Resources Research Institute
NBL	Nile Breweries Limited
NGOs	Non-Government Organisations
NSGRP	National Strategy for Growth and Reduction of Poverty
OECD	Organisation of Economic Co-operation and Development
OGAs	Outgrowers Associations
OGs	Outgrowers
PADEP	Participatory Agricultural Development and Empowerment Project
PF	Production Frontier
PFP	Partial Factor Productivity
POLICOFA	Potentials and Limitations of Contract Farming Arrangements
R&D	Research and Development
RCGA	Ruembe Cane Growers Association
REPOA	Research on Poverty Alleviation
SACCOS	Savings and Credit Cooperative Society
SADC	Southern African Development Community
SBT	Sugar Board of Tanzania
SFA	Stochastic Frontier Analysis
SUA	Sokoine University of Agriculture
SUDECO	Sugar Development Corporation
TASGA	Tanzania Sugarcane Growers Association
TDV	Tanzania Development Vision
TE	Technical efficiency
TFP	Total Factor Productivity
TPC	Tanganyika Plantation Company

	Tanzania Sugar Industry Development Strategy
TSIDS	
TSIL	Tanzania Sugar Industries Limited
TUCOCPRICOS	Turiani Cooperative for Other Crops Other than Sugarcane
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industry Development Organisation
URT	United Republic of Tanzania
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VODP	Vegetable Oil Development Project
WHO	World Health Organisation
ZSGRP	Zanzibar Strategy for Growth and Reduction of Poverty

ABSTRACT

Contract farming (CF) is widely accepted as a tool for improving performance of smallholder farmers in developing countries. In Tanzania CF has been practised in the sugar sector since 2006. However, ever since its commencement, sugarcane production trend portrays ambiguous conclusion with regard to smallholders' performance. Based on these trends, this study intended to examine the role of CF on performance focusing on process upgrading, profitability and income diversification in sugarcane production. The objectives were (i) to assess whether CF arrangements facilitate or obstruct farmers from upgrading their production processes, (ii) to determine the levels of efficiency of smallholder cane growers and identify factors influencing the efficiency levels, and (iii) to determine the extent of diversification among sugar cane growers and identify factors influencing diversification. Each objective had its own methodological approach. In analysing these objectives, various econometric tools were used e.g. Cobb Douglas stochastic profit function to analyse factors influencing farm profitability, and single-limit Tobit regression for analysing factors influencing income diversification using a sample size of 386 respondents.

The findings indicated that CF offers limited incentives and capabilities necessary for upgrading smallholder cane growers' processes. About 84% of cane growers affirmed that price of sugarcane, payment systems, and enforcement mechanisms were the main constraints for them to upgrade their production process. Similarly, the capability parameters such as training, extension services, input provision and access to credit were not included in the agreements and therefore cane growers' capabilities were adversely affected. Econometric model result indicated that, market satisfaction, a proxy for CF arrangement was not a significant determinant of farm profitability. However, descriptive statistics showed that price and payment mechanisms exhibited high profit inefficiency. This implies that market access restricts attainment of optimal farm frontier profit.

Regarding input use, fertilizer was used much below the optimum amount, suggesting that there is a considerable room for input use expansion to boost productivity, and consequently, farm profitability. Tobit result indicated that land ownership, education, household size, and access to paved road were important determinants of diversification.

On the basis of these findings, it is concluded that access to incentive and capability variables, improved pricing and payment modalities, and access to various assets might improve performance, profitability and welfare of the sugarcane growers.

TABLE OF CONTENTS

CERTIFICATION.....	i
DECLARATION AND COPYRIGHT	ii
ACKNOWLEDGEMNT	iii
DEDICATION	iv
LIST OF ABBREVIATIONS AND ACRONYMS	v
ABSTRACT	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xiv
LIST OF FIGURES.....	xv
CHAPTER ONE.....	1
INTRODUCTION AND OVERVIEW	1
1.1 Background to the problem	1
1.2 The current state of affairs of sugar sector in Tanzania.....	5
1.3 Statement of the problem.....	7
1.4 Objectives of the study	10
1.5 Significance of the study	10
1.6 Theoretical framework for analysis	11
1.7 Organisation of the thesis	13
CHAPTER TWO.....	14
STUDY AREA AND METHODOLOGICAL APPROACH.....	14
2.1 Background information of the study area	14
2.1.1 Location	15
2.1.2 Population	16
2.1.3 Occupation structure in the study area	17
2.1.4 Occupational problems	19
2.1.5 Assets profile.....	21
2.2 Methodological approach	22
2.2.1 Research design.....	22

2.2.2 Questionnaire construction and interview strategies	24
2.3 Data types and data sources	26
2.3.1 Data types.....	26
2.3.2 Sources of data	26
2.4 Data collection methods	27
2.4.1 In-depth interviews	27
2.4.2 Documentation	30
2.4.3 Observations.....	30
2.5 Target population and sample selection	30
2.5.1 Sampling frame	31
2.5.2 Sample size	31
2.5.2.1 Sample size for qualitative analysis	31
2.5.2.2 Sample size for the quantitative survey data	35
2.5.3 Sampling techniques	37
2.5.3.1 Non-probability sampling.....	38
2.5.3.2 Probability sampling.....	39
2.6 Data analysis	40
2.6.1 Qualitative data analysis	40
2.6.2 Quantitative data analysis	42
2.6.2.1 Descriptive analysis.....	42
2.6.2.2 Econometric models	42
CHAPTER THREE	44
CONTRACTUAL ARRANGEMENTS AND UPGRADING POSSIBILITIES OF	
SMALLHOLDER SUGARCANE GROWERS	44
3.1 Introduction.....	44
3.2 Background information	44
3.3 Literature Review	51
3.3.1 Contract farming arrangements.....	51
3.3.1.1 Theoretical perspectives of contracting	54
3.3.1.2 Synthesis of theoretical approaches to contract farming	58

3.3.2 Upgrading.....	60
3.3.3 Contract farming and Upgrading	62
3.3.3.1 Capability for upgrading	62
3.3.3.2 Incentives for upgrading	69
3.4 The analysis framework.....	76
3.5 Methodological issues	80
3.5.1 Sample size and sampling procedure	80
3.5.2 Data collection methods.....	81
3.5.3 Data management methods and data analysis.....	81
3.6 Results and discussion	83
3.6.1 Results.....	84
3.6.1.1 Capabilities for process upgrading in sugar value chain	84
3.6.1.2 Incentives for upgrading in the contractual arrangement	90
3.6.2 Discussion.....	95
3.6.2.1 Is process upgrading happening?.....	95
3.6.2.2 Aspects of CF restraining growers from upgrading their processes.....	103
3.7 Conclusion and policy implication	106

CHAPTER FOUR108

DETERMINANTS OF EFFICIENCY AMONG SUGARCANE PRODUCERS

UNDER CONTRACT: A STOCHASTIC PROFIT FRONTIER APPROACH...108

4.1 Introduction.....	108
4.2 Background information on contract farming and sugar sector in Tanzania.....	108
4.3 Theoretical literature.....	111
4.3.1 Definitions of major concepts	111
4.3.1.1 Production.....	111
4.3.1.2 The concept of efficiency.....	112
4.3.1.3 Techniques of efficiency measurement	117
4.3.2 Contract farming and efficiency	120
4.4 Research methodology.....	123
4.4.1 Study area, sample size, and data collection	123

4.4.2 Empirical model	124
4.5 Findings	128
4.5.1 Descriptive statistics	128
4.5.2 Profit frontier estimates.....	130
4.5.3 Profit efficiency.....	134
4.6 Discussion of the findings	137
4.7 Conclusion	145
4.8 Policy implication and recommendation	147
CHAPTER FIVE.....	148
CONTRACT FARMING AND SUGARCANE OUTGROWERS' INCOME	
DIVERSIFICATION STRATEGIES.....	148
5.1 Introduction.....	148
5.2 Background information.....	148
5.3 Theoretical consideration.....	151
5.3.1 Diversification as a concept	152
5.3.2 Livelihood assets and contract farming	153
5.3.3 Empirical evidence.....	159
5.3.4 Conceptual framework.....	161
5.3.4.1 Analytical model.....	163
5.4 Methodology.....	164
5.4.1 Analysis of diversification and Econometric modeling	165
5.4.1.1 Diversification analysis.....	165
5.4.1.2 Modeling diversification.....	173
5.4.1.3 Variables used.....	170
5.5 Results and discussion	175
5.5.1 Descriptive statistics	175
5.5.2 Sugarcane growers' participation in the diversification of activities.....	178
5.5.3 Income share by activity to total household income in the study areas	179
5.5.4 Income shares by size of asset endowments	181

5.5.5 Determinants of income diversification among smallholder cane growers	184
5.5.5.1 Determinants of Income diversification by activity.....	185
5.5.5.2 Determinants of the overall income diversification.....	190
5.6 Concluding remarks and policy implications	192
CHAPTER SIX.....	196
SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS.....	196
6.1 Overview.....	196
6.2 Summary of major findings	196
6.2.1 Aspects of CF arrangements constraining cane growers from upgrading their processes	196
6.2.2 Farm profit efficiency	197
6.2.3 Extent and intensity of income diversification	198
6.3 Conclusions.....	199
6.4 Contribution of the study to knowledge	200
6.5 Overall policy implications.....	202
6.6 Areas for further research	203
REFERENCES	205
LIST OF APPENDICES.....	227

LIST OF TABLES

Table 1.1: Sugar production trend in Tanzania for the period 2005/06 – 2013/14	6
Table 2.1 Study units	33
Table 3.1 Description of the ‘capability’ and ‘incentive’ parameters for process upgrading	83
Table 3.2: Perception towards incentives and capability parameters for Kilomber.....	86
Table 3.3: Perception towards incentives and capability parameters for Turiani	88
Table 3.4: Perception towards incentives and capability parameters across cases	92
Table 3.5: Reasons for the decrease in output.....	93
Table 3.6: Perception towards factors constraining sugarcane production under CF	93
Table 3.7: DRD allocation among associations in Kilombero (2013/2014)	100
Table 3.8: Constraints for upgrading in the production	103
Table 4.1: Summary statistics for profit function and inefficiency variables	130
Table 4.2: Parameter estimates of the stochastic profit frontier and profit inefficiency	132
Table 4.3: Summary of profit efficiency by farm-specific and institutional characteristics	136
Table 5.1: Variables used in the Tobit for regression analyses	172
Table 5.2: Expected signs for explanatory variables and heterogeneity on different income streams	173
Table 5.3: Descriptive statistics of the variables used in the Tobit models	177
Table 5.4: Percentages of smallholder farmers involved in diversifying activity portfolios in the study areas for the year 2012	179
Table 5.5: Activities participation rates and shares in total cane growers’ income in Kilombero and Turiani	181
Table 5.6: Tobit maximum likelihood estimates of the determinants of income diversification by activity type.	186
Table 5.7: Tobit results for the determinants of overall diversification.....	191

LIST OF FIGURES

Figure 1.1: Sugarcane production trend for Outgrowers in Kilombero and Turiani.....	7
Figure 2.1: Distribution of sugarcane production in Tanzania for the period from 2005- 2010.....	15
Figure 2.2: Regional comparison of average sugarcane yields (MT/Ha) from 2005-2010	15
Figure 3.1: The analysis framework for process upgrading.....	78
Figure 3.2(a): Duration taken to effect payment in Kilombero.....	91
Figure 3.2(b): Duration taken to effect payment in Turiani.....	91
Figure 3.3(a): Rejected burnt-cane and left uncut in the field.....	102
Figure 3.3(b): Heap of cane, cut and left to rot in the field.....	102
Figure 4.1 Profit frontier function.....	114
Figure 4.2: Profit efficiency scores for smallholder cane growers based on Cobb Douglas function.....	137
Figure 5.1: Conceptual framework.....	162
Figure 5.2: Classification of sugarcane growers' income sources.....	178
Figure 5.3: Income share by size of land asset endowments in the study areas Source: Calculated from POLICOFA survey data (2012).....	182

CHAPTER ONE

INTRODUCTION AND OVERVIEW

1.1 Background to the problem

Agricultural sector is among potential sectors for accelerating development and economic growth particularly in developing countries. It has gained worldwide acceptance as a key sector for the provision of food and nutrition, employment, income, and capital to industries (Diao, Hazell, Resnick, & Thurlow, 2007). Improvement in agricultural production reduces food shortage, lowers food prices and ultimately the cost of living falls (Diao *et al.*, 2007). Similarly, the role of agriculture in the provision of employment and income is documented in various studies (see, for example Diao *et al.*, 2007; International Food Policy Research Institute [IFPRI], 2012). These studies argued that agricultural sector contributes 65% of the total employment and 32% of Africa's gross domestic product (GDP). Likewise, agricultural sector in Sub-Saharan Africa, Tanzania in particular provides employment to over 75% of Tanzanian population, contributes on average 95% of food availability in the country, and in 2012 it contributed about 26.8% of the country's GDP (URT, 2013; Meyer, 2008; Diao, Hazell, & Thurlow, 2010).

Despite the importance of agricultural sector in provision of employment, food and nutrition, and country's GDP, yet its growth rate in terms of productivity is still questionable. According to Diao *et al.* (2010), agriculture growth rate in most of African countries is mainly by acreage expansion rather than increase in productivity. And the barriers to increased productivity in Tanzania and Sub Saharan Africa in general include limited resources, insufficient access to inputs, services, and markets (IFPRI, 2012). Other challenges facing smallholder farmers include poor access to and low usage of inputs such as improved seeds and fertilizer; under investment in productivity enhancing technology; poor coordination and limited capacity; dependency on unreliable rain-fed agriculture; limited use of the available water resources for irrigated agriculture; institutional and market failures (Savri *et al.*, 2006; Pauw & Thurlow, 2010; Ngaiza, 2012).

These challenges can be grouped into three main categories: resource constraining factors; market constraining factors; and institutional constraints. According to Ellis (2003), resource constraining can further be grouped into five categories: natural resources (land, water and pasture); physical resources created by economic production (roads, irrigation works, and producer goods such as machinery); human resources comprised of the quantity and quality of labour available that determined by household size, education skills, and health of the household members; financial resources (stock of money, other savings in liquid form, and credit accessibility); and social capital which consists of networking from membership of the group or support from trade of professional associations such as farmers associations. Shortage of these resources fuels low scaling up capacity and competence of farmers in their production process (Bienabe, Coronel, LeCoq, & Liagre, 2004).

Concerning market constraints, smallholder farmers are often disadvantaged in terms of accessing and satisfying high-value markets. Vorley and Bienabe (2007) argued that poor access to and failure to satisfy high-value markets is rooted in their resource constraints. According to these authors, producing for remunerative end markets calls for endowment of production resources such as land, labour force, water, capital, good management of resources, and market information. Lack of these resources affects the possibility of meeting the quality and volume of products required by the market. Poor product quality and low volume restrict majority of farmers' sales either at the local market or at the farm gate level (Sanginga *et al.*, 2004). Bienabe *et al.* (2004) argued that only 12% of cereals produced by billions of people working in the farming sector worldwide are sold on the international market, and the remained surpluses are sold locally at low prices. Such a situation reduces the capability and motivation of smallholder farmers to participate fully in production, consequently affects adversely agricultural performance.

Institutions also hinder agricultural performance, and they include structures and processes (Howlett, 2001). According to this author, structures imply levels of government and private sector involvement in economic activities, and processes imply laws, policies, and culture which are introduced to regulate the economy. The

government may introduce policy and/ or institutional frameworks, which may not consistently support the private sector operation or may have impact on individuals' economic activities. Similarly, private involvement as result of state withdrawal from commercial activities may lead to myriad smallholder farmers facing little influence over business negotiation triggering poor terms of exchange, little support services such as credit, extension, and agricultural inputs (Magingxa & Kamara, 2003).

Following these challenges, various international agencies like the World Bank and International Monetary Fund (IMF) have been busy designing macro-level initiatives to boost the economic growth of the least developing countries by addressing resource, market, and institutional constraints. One most popular strategy adopted was Stabilisation and Structural Adjustment Plans. These structural adjustments were intended among others to end market monopolies, reduce parastatal involvement in the supply of inputs, marketing and processing, reduce and remove subsidies, price controls and impediments to private sector activities, remove restraints on foreign trade, and promote the participation of private sector (Dixon, Gulliver & Gibbon, 2001). Next to the structural adjustment initiative, was the formation of various international agreements and establishment of the World Trade Organisation (WTO) in 1990s which fueled further the liberalization and globalization of the economies, and agricultural sector was exposed to a highly competitive global market (World Bank, 2007).

Tanzania as one of the recipients of these global structural adjustment initiatives, started to adopt them in 1986 when a wide range of institutional and economic reforms were undertaken in the country. After country's major reforms, some other policy interventions have also been designed and implemented aimed at improving the performance of the agricultural sector. Some of these interventions the government of Tanzania is currently implementing include "KILIMO KWANZA" or Agriculture First, a declaration putting emphasis on transformation of agriculture from subsistence to commercial one. It is implemented alongside other policies, projects, and strategic frameworks such as Tanzania Development Vision 2025 (TDV 2025), National Strategy for Growth and Reduction of Poverty (NSGRP) and Zanzibar Strategy for Growth and Reduction of Poverty (ZSGRP), Participatory Agricultural Development and

Empowerment Project (PADEP), Agricultural Sector Development Strategy (ASDS), Agricultural Sector Development Programme (ASDP) and Comprehensive African Agriculture Development Programme (CAADP). Prior to these policies, projects and strategic frameworks, there existed other policies and strategies which were implemented with similar focus. Such policies included Politics is Agriculture – Iringa Declaration-1974 termed in Swahili “*Siasa ni Kilimo*”, Life and Death Effort to Improve Agriculture (“*Kilimo cha Kufa na Kupona*”). Others were Food for Life (“*Chakula ni Uhai*”), and Modern Agriculture (“*Kilimo cha Kisasa*”) (Ngaiza, 2012). However, all these past policy initiatives were centrally planned and largely implemented by the government.

As opposed to previous strategies which did not succeed probably because were purely state-led initiatives, the current policies and frameworks are implemented with more focus on integrating public and private sectors together. One way of achieving this is through employing contracts in agricultural activities. The use of contracts in crop-farming according to URT (2010) will “promote public-private sector partnerships and accelerate technology transfer, capital inflow, and assured market for crop production” (p.1). Similarly, this study considers the use of contracts, or simply contract farming (CF) arrangement as an important institution for gluing public-private partnerships. A number of literatures contemplate CF as an alternative institutional arrangement which has the potential to promote agricultural activities by integrating smallholder farmers into the modern sector (see for example Key & Runsten, 1999; Bijman, 2008). CF arrangement as a kind of governance structure creates rights and obligations to both producers and buyers. It requires among others, producers not only to produce but also supply the produce at right time, right quality and quantity to the contracted buyer without an apology. Similarly, the buyer (contractor) is obliged to provide smallholder farmers with technical assistance, production inputs (e.g. seeds, fertilizer, training, extension, transport and even land preparation), and farm investment on credit (Singh, 2005; Setboonsarng, Leung, & Stefan, 2008; Prowse, 2012). CF also offers learning opportunities to smallholder farmers through acquisition of certain types of skills necessary for developing smallholder farmers’ competence (Prowse, 2012). These

services offered by CF arrangements are considered as “opportunities” vital for solving smallholder farmers’ problems related to resources, markets, and institutions.

Nevertheless, CF has been criticized for a number of issues. First, its effectiveness in enhancing upgrading and efficiency in farm production is adversely affected by a number of constraints as summarised by Kumar and Kumar (2008): delay in payment for crops produce; violation of terms and conditions; farmers’ negligence in maintaining quality and difficulty in meeting quality requirements. Others are lack of government control; delay in arranging inputs; provision of inputs at higher rates; high rate of hiring transport vehicles; and inability to provide proper transport facilities to farmers due to poor road networks especially during wet season. Second, contract farming has been criticised as being a tool for exploiting farmers due to unequal power relationships among players (Prowse, 2012). In addition to that Lejars *et al.* (2010) argued that incentive packages offered by CF arrangements are often associated with complex and sophisticated formulae and operationalisation lacks transparency and rationality. Indeed, payment systems are subject to mistrust and sometimes conflict between outgrowers and processors. And division of proceeds determination is based on a hypothetical calculation representing company income but does not reflect actual company’s revenues (Yamba et al., 2008). In reality is difficult to design incentive scheme and warranty that equity is always maintained while ensuring incentive for both growers and millers are not distorted (Todd & Forber, 2005).

1.2 The current state of affairs of sugar sector in Tanzania

The sugar sector in Tanzania started in early 1924 when Tanganyika Plantation Company (TPC) factory based in Kilimanjaro was established, followed by Kilombero Sugar and Mtibwa Sugar Companies located in Morogoro in 1962 and 1963, respectively. Up to now, the sector has grown to having five main sugar factories in the country, and the major contributor of foreign exchange earnings of about US\$ 28 million per annum. It contributes also about Tsh. 19.8 billion to smallholder farmers; employs 14,000 people directly in the estates and accounts for 30,000 seasonal employees in the contractual arrangement; and 81,360 people on secondary employment (Matango, 2006).

Based on POLICOFA Survey Data (2012), the number of smallholder cane growers has increased to more than 21,000 in the study areas alone.

The sugar sector has also demonstrated sustainable and impressive sugar production growth rate over years. The trend of sugar production (Table 1.1) shows a growing pattern with some fluctuations caused by unstable weather for Mtibwa and Kilombero sugar companies, and partly due to mills' technical problems and weather fluctuations for TPC (Sugar Board of Tanzania [SBT], 2014).

Indeed, the observed increase in sugar production (Table 1.1) is a reflection of the corresponding increase in sugarcane outputs produced together by smallholder farmers and factory estates. The general sugarcane production trend in Tanzania for the past fifty years (from 1961/62 – 2009/10) indicates that sugarcane production has been growing over time (FAO, 2011). Table 1.1 displays sugar production trend in Tanzania for the period from 2005/2006 to 2013/2014.

Table 1.1: Sugar production trend in Tanzania for the period 2005/06 – 2013/14

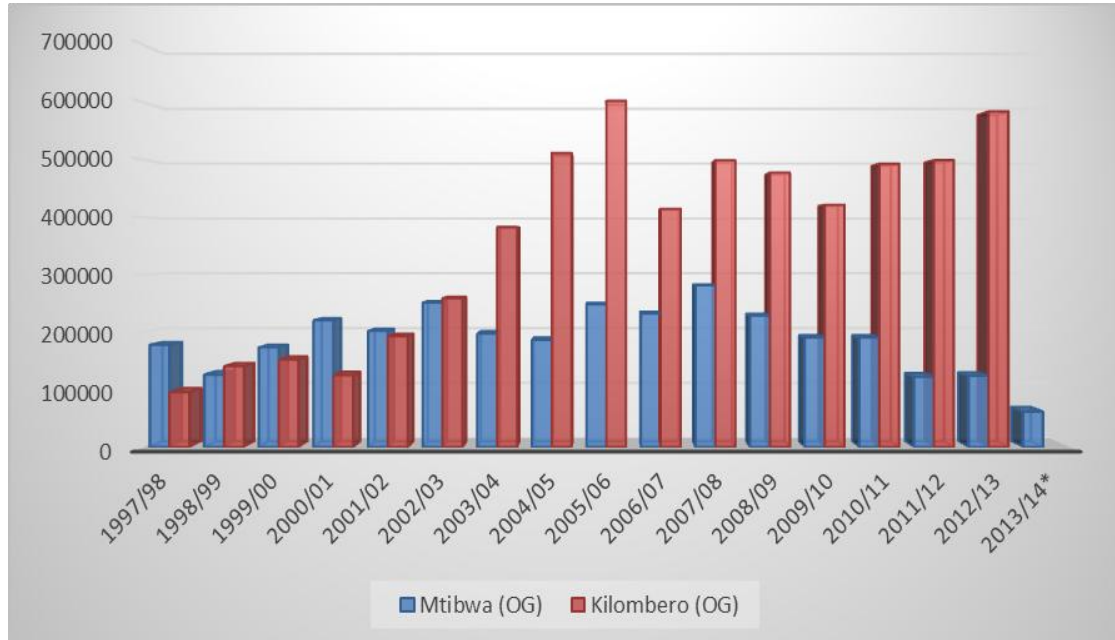
Production season	Sugar production in tons				Total	Average
	Kilombero	Mtibwa	TPC Ltd	Kagera		
2005/06	136,941	49,170	60,503	16,703	263,317	65,829.25
2006/07	103,682	33,666	34,887	19,768	192,003	48,000.75
2007/08	127,436	44,810	59,247	33,940	265,433	66,358.25
2008/09	118,023	42,863	78,483	40,482	279,851	69,962.75
2009/10	119,623	40,029	68,616	35,193	263,461	65,865.25
2010/11	126,824	47,301	85,928	44,082	304,135	76,033.75
2011/12	113,100	28,269	86,148	35,362	262,879	65,719.75
2012/13	126,736.8	38,794.1	86,078	45,089	296,694.9	74,174.47
2013/14	116,495	26,491	101,226	50,207	294,419	73,604.75
Average	120,985	39,044	73,457	35,647	269,133	

Source: Sugar Board of Tanzania, 2014

However, when sugarcane production is disaggregated between outgrowers and factory estates, sugarcane production trend behaves differently. For example, production trend in Kilombero and Turiani division for outgrowers' farms alone for the period from 1996/97 – 2012/13, with 2013/14 projection for Turiani gives mixed and contradicting conclusion regarding outgrowers' performance. Trend indicates that there is a steady growth of sugarcane in Kilombero with only a sharp drop in the 2006/07 and 2009/10 production seasons caused by severe droughts (SBT, 2014). In Turiani production growth was observed increasing just before 2008/09 production season from which its

growth has been declining continuously just a year later after the introduction of contracts in the sugar sector (see Figure 1.1).

Figure 1.1: Sugarcane production trend for Outgrowers in Kilombero and Turiani



Source: Kilombero and Mtibwa yearly reports (1999 – 2013) with 2013/14 projection.

The observed trend (Figure 1.1) sheds light on ambiguous responses of CF arrangements on smallholder farmers’ performance in the study area. Also, the role of CF arrangements is confusing because there are supporters and antagonists of CF on improving agrarian sector in the awake of reforms. All these motivated the initiation of the current study to investigate how the on-going contractual arrangements in the sugar sector in Tanzania facilitate or obstruct smallholders’ upgrading, efficiency and diversification strategy among smallholder farmers in Kilombero and Turiani.

1.3 Statement of the problem

Commencement of CF arrangements in the sugar sector in Tanzania dates far back to the time when Kilombero and Mtibwa sugar companies were established and run by the government. During this era, sugarcane was produced by milling companies through state owned cane-estates and supplemented by smallholder sugarcane growers under the system known as “outgrowers’ scheme”. Under outgrowers’ scheme, smallholder cane growers received full support from government agencies. Among the supports offered to

smallholder cane growers by the government include extension services, input provision (such as fertilizer, herbicides), farming and harvesting operations at subsidised costs. Production trend was observed increasing with fluctuations (see Figure 1.1). With the adoption of economic reforms in 1990s, the government had been withdrawing slowly from supporting farmers and in 2006 the first written contract was introduced in Kilombero and subsequently in Mtibwa where the formal contract was introduced in 2009. Since the commencement of the formal contracts in the study areas, production trend displays ambiguous picture across areas regarding smallholder cane outgrowers' performance.

In 1997/98, the performance of smallholder sugarcane production in Turiani surpassed that of Kilombero (Figure 1.1). The same situation was for 1999/00 and much prominently for 2001/02. Starting in 2003/04, Turiani's smallholder sugarcane production lagged far behind that of Kilombero (Figure 1.1). From 2007/08, not only did Turiani's smallholder sugarcane production remain far behind that of Kilombero, but it also started to experience a consistently declining trend. The fact that CF was formally introduced in 2009, the year when the production of small farmers started to decline, this poses some questions: to what extent was CF associated or not associated with this situation? Do CF arrangements have any influence over the observed trend? How did the CF arrangement generally affect the performance of the smallholders?

Based on our knowledge, very few and probably none of the studies have been conducted to examine the role of contract farming arrangements on smallholders' performance in the study area. Some of the studies done on sugarcane-performance in Tanzania have generally focused on ecology, processing facilities, and technologies as driving factors to productivity (see for example Tarimo & Takamura, 1998; Tanzania National census of Agriculture, 2002/03; Msuya & Ashimongo, 2005; Fernandez & Nutball, 2009).

Other studies outside Tanzania, which have contributed intensively to uncover the impact of CF on improving farm performance, efficiency, and welfare have focused primarily on two aspects of CF, namely participation incentives and the impact on

farms, normally evaluated by treating CF as a binary explanatory variable of CF participation.

For example, Miyata et al. (2009); Bellemare (2012) examined the impact of CF on improving farmer efficiency and welfare by treating CF as a binary explanatory variable of CF participation. Others who treated CF as a binary explanatory variable had exclusively focused on farmers' decision to participate in CF without evaluating its role on productivity and efficiency (see for example Guo, 2005; Zhu & Wang, 2007; Musara, Zivenge, Chagwiza, Chimvurahwe, & Dube, 2011). Meanwhile Oya (2012) argues that those who treat contract as a package neglect variation in practicing contract as a variable to be explored and explained.

Consequently, since previous studies concluded that CF could improve farmers' performance and welfare, the policy implication is that efforts should now be focused on increasing CF participation. But, these studies have been unable to identify the specific and critical motivating factors of CF participation needed to well inform the policy. A central proposition of the current study is that irrespective of the highlighted complexities in the contractual arrangements, the opportunities from CF arrangements may offer important upgrading opportunities to smallholder farmers, and ultimately farm profitability and incomes. Showing how this occurs, sugar sector in Tanzania was used as our model for studying the role of contract farming opportunities in enhancing smallholder farmers' upgrading strategies and hence efficiency and household income diversification decision. To this end, it was imperative to unpack the opportunities of the CF arrangements and understand which specific factors are associated with farm's efficiency. Therefore, this study evaluated the influence of CF arrangements on farm's performance by disaggregating CF package using the opportunities available therein as explanatory variables instead of CF as a binary variable.

We used this approach because the study's sample had no control group. All respondents in the sample participated in contract farming arrangements.

1.4 Objectives of the study

The overall objective of the research was to determine the influence of contract farming opportunities on upgrading, efficiency and income diversification strategies among smallholder farmers in Kilombero and Turiani. Specifically, it intended to achieve the following:

- i. To assess whether contract farming arrangements facilitate or obstruct farmers from upgrading their production processes in the sugarcane subsector, and identify specific factors facilitating or obstructing process upgrading.
- ii. To determine and compare the efficiency levels of the smallholder cane-growers and identify the factors influencing efficiency levels of the outgrowers by examining whether the inefficiency effects are significantly accountable for efficiency variation among smallholder cane growers in the study areas.
- iii. To determine levels of income diversification among cane growers and identify factors influencing diversification.

The specific objective 1 was intended to shed light on whether CF upgrades or downgrades sugarcane farming processes and how do farmers respond to the outcomes of CF. Specific objective 2 on the other hand intended to predict whether outgrowers' efficiency was influenced by CF. Specific objective 3 intended to contribute to the diversification debate base on sustainable livelihoods framework in which diversification and/ or intensification are debatable phenomenon for policy measures to promote both sugarcane and non-cane activities. The assumption was that those who are more productive were expected to behave differently in terms of diversification strategy compared to those who are less productive.

1.5 Significance of the study

Understanding the role of contract farming on influencing upgrading and efficiency among smallholder farmers in the sugar sector is important because smallholder farmers' profit efficiency provides a signal about their competences. This helps policy

makers who seek to promote CF as a means of increasing farmers' efficiency to know exactly which areas of CF arrangement need intervention. Moreover, the cumulative profit efficiency score obtained by this study tells the extent to which smallholder farmers can efficiently use their inputs, which is an important indicator of the sugar sector performance and its future prospects.

Likewise, farmers upgrading status disclosed by this study helps to inform sugar processors on the competence and sustainability of the upstream production which enables processors to re-think on the organisation strategy to adopt, that is whether should depend on them or should produce raw materials for themselves.

On the other hand, this study equips us with better understanding of why sugarcane growers diversify income sources. This helps to assess the likely impact of recent structural reforms of sugar sector in Tanzania on households' livelihoods, and adds to the literature by contributing to the limited number of studies in Tanzania that analyse the influence of CF in sugarcane subsector on diversification strategy.

1.6 Theoretical framework for analysis

Increase in smallholder farmers' performance particularly in the production process is important following recent reforms and various interventions towards addressing agricultural challenges in relay to modernize the sector. Sector modernisation requires skills and knowledge to help farmers make viable decisions. This is due to the fact that smallholder farmers are characterised by limited resources (human and non-human), insufficient access to input, services and market, low level of investment in agricultural infrastructure (IFPRI, 2012).

Hence, small farmers need to be empowered and motivated to participate fully in the agricultural transformation initiatives. Such empowerment should focus on human and non-human resource capabilities while motivation focuses on improving markets.

Therefore, the theoretical framework for analysing different topics in this thesis was based on assumption that CF arrangement facilitates a win-win interaction between suppliers (smallholder farmers), buyers, and other stakeholders in the value chain (e.g.

associations of farmers, cooperatives, government institutions). Second, CF creates incentives and capabilities to smallholder farmers for improved performance and livelihoods.

In analysing the specific objective one (upgrading of production process), the framework developed by Humphrey (2004) and USAID (2006) was adopted. Under this framework process upgrading is assumed to be a function of capability for upgrading and incentive for upgrading. Capability for upgrading constitutes two parameters (acquisition of capability and learning process). Variables for the acquisition of capability include input provision, credit access, investment and R&D; while learning process includes availability of training, extension services, and best farming practices. Similarly, incentive parameters constitute price of output, payment mechanisms, availability of supply, and infrastructure. All these variables are the basis for capability and incentive enhancement for the achievement of farmers' competitiveness and are assumed from contractual arrangement. The detailed conceptual framework for analysis is addressed in chapter three.

Likewise, the specific objective two (profit efficiency) was analysed based on the stochastic frontier framework introduced by Farrell (1957). This framework was simultaneously strengthened to apply in the field of agriculture by Aigner, Lovell, and Schmidt (1977), and Meeusen and Van den Broeck (1977). The framework assumes that farm profitability is a function of resource endowment and incentive parameters. The application of the framework in examining profit efficiency of farms has shown success in a number of studies (see for example Rahman, 2003; Kolawole, 2006; Ogunniyi, 2011; Masuku, 2011; Oladeebo & Oluwaranti, 2012). The profit efficiency framework relative to asset endowment is addressed in detail in chapter four.

Similarly, specific objective three (households' diversification decision) was analysed based on livelihood framework perspective, in which asset endowment is used to assess the extent of diversification. According to Jacobson (2010) CF increases household's asset endowment through human and non-human capability's enhancement. Asset endowment plays important role for rural poor household in obtaining and sustaining their livelihoods outside agriculture. This means that the capacity to diversify is higher

for the asset-rich households than asset-poor households. For detailed framework analysing diversification based on human and non-human asset endowment see Figure 5.1 in chapter five.

1.7 Organisation of the thesis

The structure of the thesis is organised as follows: next to chapter one is chapter two which describes the study area and methodological approach. It covers background information of the study area including location, population, occupation structure, and asset profile; general approach and data collection methods, questionnaire construction and interview strategies, sample size and sampling design, and methods of data analysis. Chapter three assesses the role of contract farming in influencing upgrading of farming processes. It covers introduction, conceptual framework, empirical literature, data analysis, results, discussion and concluding remarks with policy implication. The fourth chapter is on the role of contract farming arrangement on smallholder farms' profitability using Cobb Douglass frontier profit function. It covers justification of the choice of the analytical methods, information on data, variables used, and empirical model, results, discussion, conclusion and policy implication. The fifth chapter is about sugarcane growers' income diversification strategies.

This is examined using Tobit model, and it consists of the following subsections; introductory part, conceptual framework, methodology, results and discussion and policy implication. Finally, chapter sixth presents summary, conclusions and policy implication of the study.

CHAPTER TWO

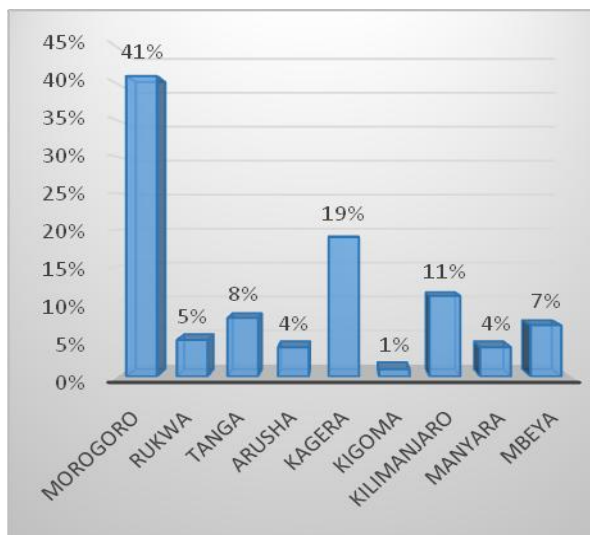
STUDY AREA AND METHODOLOGICAL APPROACH

2.1 Background information of the study area

Sugarcane is grown in almost every region in Tanzania. Figure 2.1 indicates the distribution of sugarcane cultivation in metric tons per hectare regional wise and Figure 2.2 indicates average yields per hectare by region. From Figures 2.1 and 2.2 it is observed that areas where sugar mills are located have higher share of sugarcane production and are characterised by relatively higher yields. The regions with such characteristics include Morogoro which contributes 41% of the total production in the country, Kagera contributes 19%, and Kilimanjaro 11%. Other areas of the country contribute in total 29% share of sugarcane produced, whereby Tanga Region contributes 8%, Mbeya 7%, Rukwa 5%, Arusha and Manyara 4% each, and Kigoma contributes 1% (Figure 2.1). Morogoro is a region with the highest average sugarcane yields (Figure 2.2), followed by Kilimanjaro and Kagera. These three regions produce yields above national average (117mt/Ha) (Nkonya & Barreiro-Hurle, 2012), the remaining regions produce far less than national average, which point at a positive impact of reliable market on sugarcane production.

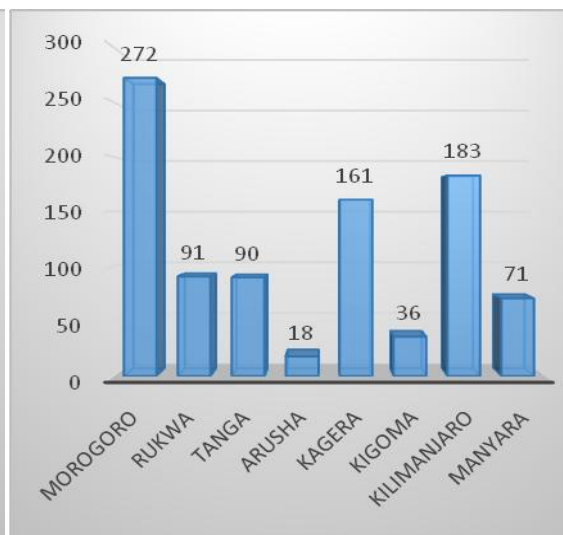
Among the first three best regions for sugarcane production in the country, Morogoro, Kilimanjaro, and Kagera, Kilimanjaro does not involve smallholder farmers in sugarcane production. Morogoro and Kagera involve smallholder farmers but Kagera started just recently (2008/09) compared to Morogoro which started in the early 1960s. It is from this background information that Morogoro was purposely selected as the study region among other regions in Tanzania following criteria summarised below: (1) it is a region with highest sugarcane yields in the country, (2) it is a region with a very long experience in involving smallholder farmers in sugarcane production.

Figure 2.1: Distribution of sugarcane production in Tanzania for the period from 2005-2010



Source: Nkonya and Barreiro-Hurle (2012)

Figure 2.2: Regional comparison of average sugarcane yields (MT/Ha) from 2005-2010



Source: Nkonya and Barreiro-Hurle (2012)

2.1.1 Location

Morogoro Region is located between latitude 5 0 58'' and 10 0 0'' South of the Equator and Longitude 35 0 30'' to the East. Morogoro Region is about 200km West of Dar Es Salaam. It is bordered by Manyara and Tanga to the North, Dodoma and Iringa to the West, Coast and Lindi to the East and Ruvuma to the South. Its climate is highly influenced by the Indian Ocean, so it has two rain seasons. The short rain season starts in October and ends in January, and the long rain season begins in mid-February and ends in May. Morogoro Region is occupied by 2,108,071 inhabitants (Population Census, 2012) and it is composed of six administrative districts namely Morogoro, Mvomero, Kilosa, Kilombero, Gairo and Ulanga; and six Local Governments Authorities namely Kilombero, Kilosa, Ulanga, Morogoro, Morogoro Municipality and Mvomero.

Despite the existence of natural resources that provide a wide range of economic activities such as agriculture (crop production), livestock keeping, forestry, beekeeping, fishing, tourism and small scale industries in addition to good rainfall, fertile land, economic infrastructure and power supply, including the existence of sugar processing factories in the region, poverty is still high (Morogoro Regional Profile [MRP], 2008).

The sugar processing factories in Morogoro Region are located in two areas famous for sugarcane farming, namely, Kilombero and Mtibwa in Turiani. These areas have sugar factories which attract investment in sugarcane cultivation by small, medium, and large scale farmers. Kilombero area is served by two sugar factories, namely Kilombero 1 (K1) and Kilombero 2 (K2) both falling under the management of one company called Kilombero Sugar Company Limited (KSCL). K1 known as Msolwa is located at Kilombero, in Kilombero District and K2 known as Ruembe is located in Kilosa District. The two factories are found adjacent of each other just separated by the Great Ruaha River. Kilombero Sugar Company was privatised to Illovo Sugar Limited which acquired 75% and retaining 25% to the government. The company has additional merit for being included in the study. After privatisation it became one among few companies in the country to provide outgrowers with technical support such as clean seed cane, and it made improvement of estates infrastructure, expansion of cane unloading stations, cane preparation factory, weigh bridges and instrumentation automation (SBT, 2011).

Turiani area lies in the Savannah zone within Mvomero District. The Savannah zone is characterised by being located in an altitude ranging from 600 – 800m above sea level. The other zones found in the District include Highlands and Mountainous zone, and Low and Semi Mountainous zone. Turiani area is served by one sugar mill, namely Mtibwa Sugar Estate Ltd (MSEL). The company is located at 38E – 6S in Lukenge village, Mtibwa Ward in Turiani Division. The mill is 102km North of Morogoro town and 290km from Dar Es Salaam. The company occupies an area more than 6000 ha of land (SBT, 2011). The company was privatised in 1999 and purchased by a local company called Tanzania Sugar Industries Ltd (TSIL). Before privatisation MSEL was performing below potential due to a number of factors such as lack of spare parts, lack of serious maintenance work, obsolete of equipment, and poor cane quality, but since privatisation MSEL had been making significant investment (SBT, 2011).

2.1.2 Population

For the purpose of the current study, the target population included household heads (as unit of analysis) for whom sugarcane cultivation was a mandatory activity among other livelihood occupations. This means that the sample was drawn from sugarcane growing

population, from Kilombero and Turiani cane growers' community. In the year 2006 cane growers population had a total number of 14,000 outgrowers (Matango, 2006). The population has increased to a total of 24,937 registered cane growers (SBT, 2014).

2.1.3 Occupation structure in the study area

The economy of Kilombero and Turiani is dominated by smaller farmers engaged mainly in agricultural employment. The average land cultivated by smallholder farmers varies from less than 1 ha to 3 ha of land, and majority of the crop area is cultivated by hand, the remaining area farmers use ploughs and tractors (Sarris, Savastano, & Christiaensen, 2006). In addition to agriculture, traditional fishing is also practiced along the Kilombero and Wami rivers. Likewise, the areas experience potential growth of services such as hotels, petty trading, and private offices due to population growth and urbanization.

(i) Farm employment activities

Farming in Kilombero and Turiani is characterised by small scale and subsistence farming carried out by the majority of the smallholders. The minority large scale farming is carried out by companies like Kilombero and Mtibwa sugar estates and few individuals found in the sugarcane subsector. In the study areas most of the households engaged in crop production are mainly involved in rice, maize, sugarcane, banana, cocoyam, cassava and sweet potatoes. Yields from these farms are generally low due to poor methods of farming employed by these farmers who produce at subsistence level. The use of improved seeds, fertilizers, and pesticides are in very limited usage (MRP, 2008).

The structure of farming occupation in the study area is based on resource endowment, and can be elucidated better using statistics. In the year 2005/06 for example, the estimated land ownership used for cultivation of major cash crops in the study areas was as follows: sugarcane occupied 68.55% of all land used for cash crop production, and the remaining 31.45% was occupied jointly by sesame, coconut, sunflower and cotton, while food crops such as maize occupied 47% of the total land, rice 37%, and sorghum, cassava, legumes and banana jointly occupied 16% of the total land (URT, 2007). These

statistics help to predict the importance of sugarcane crop relative to other cash crops and the importance of maize and rice for the food crops in the study areas.

Sugarcane cultivation operates under contractual arrangement between outgrowers and millers. Sugarcane subsector in the two areas has experienced structural heterogeneity following the occurrence of various reforms in the sugar industry. Before privatisation the factories were running below capacity and the outgrowers supplied less sugarcane to the mill than the mill's estate did. Management of sugarcane production was carried out under the outgrowers' scheme which was mainly controlled by the state. The Government was responsible for input provision and training of outgrowers through various state agencies such as Kilombero Sugar Institute, Kibaha Sugarcane Research Institute, and Ministry of Agriculture through department of field extension services. After privatisation these services ceased gradually, because the new owners of the companies did not provide any service to farmers, they monitor outgrowers' fields by "eyes on" and "hands off" style.

Following withdrawal of the government from assisting farmers after privatisation policy, the apex of outgrowers' associations called Tanzania Sugarcane Growers Association (TASGA) pushed to get contracts which could help farmers to secure loan from banks using sugarcane fields as collateral. In 1999 the first contract was drafted, but Illovo rejected it and returned with a counter-draft in 2000 which TASGA rejected too. By 2006, after years of sending revised drafts back and forth like a *ping bong ball* Illovo turned the 42nd revised draft to TASGA and said 'take it or leave it'. Finally, by late June 2006 the associations on behalf of the outgrowers and the company on its behalf signed the first contract in Kilombero with agreement to pay 53% of the proceeds to the farmers with 1% increment each year. Subsequently, in 2009 the first contract was signed in Mtibwa.

With privatisation, factories were rehabilitated and their capacities were improved, as a result demand for sugarcane increased. However, in Mtibwa the expansion of demand for sugarcane existed for a shorter period, after which supply of sugarcane started to decline continuously (see Figure 1.1). This difference in the sugarcane supply pattern between Kilombero and Turiani was mainly attributed to differences in incentives

offered to farmers by the companies. For example, KSCL offers higher prices for outgrowers' sugarcane compared to sugarcane price offered by MSEL. Furthermore, KSCL has improved and maintained roads for easy transportation of sugarcane from farm gate to the mill as opposed to MSEL (Kamuzora, 2010).

(ii) *Off-farm and wage employment activities*

The area experiences tremendous population growth as a result of many attractions. First of all, company estates create many temporary and permanent employment activities during weeding and harvesting operations. During such seasons job seekers from many parts of the country e.g. Iringa, Mbeya, Kigoma, and Dodoma try to find jobs with the estate and subcontractors. Second, there is eco-tourism opportunity in the area. The study area is characterised by beautiful mountainous features and attractive forests rich with biodiversity potential for tourism. Thus, off-farm employment activities such as handcrafts, sewing, carpentry and masonry, including all other sorts of petty businesses have been operating and growing tremendously while contributing significantly to the total household income. Similarly, wage employment activities have been potential sources of household income. Many farm-wage employment activities are seasonal jobs created by company's sugarcane estates especially when weeding, fertilizer application and harvesting operations are due. These activities absorb labour from the community surrounding the area including immigrants, since such activities are labour intensive (MRP, 2008).

2.1.4 Occupational problems

Households in Kilombero and Turiani, just like any other parts of the country their occupations are generally constrained by various factors including unreliable weather, high prices of inputs (seeds and fertilizer for sugarcane crop), low productivity and low prices for the farm produce, low utilisation of appropriate technologies and ineffective extension services (URT, 2010). According to this author, households in the study area lack entrepreneurial skills, face poor infrastructure (roads) coupled with lack of agro-processing facilities for value addition and shelf life to farm produce. The latter constraint was regarded as the most important problem because in good or lucky season

when farmers' harvests increase in volumes, the same becomes bad season because farmers make losses instead of profits due to lower prices received from local markets and or crop loss caused by the lack of modern storage facilities (URT,2010).

Other occupational problems facing smallholder sugarcane farmers in the study areas as Matango (2006) pointed out, include sugarcane pricing problems, sugarcane weighing problems, and problems in rendement determination. Rendement determination is not transparent and is embraced with many unanswered questions. For example, it is a norm for rendement measurement to read 'zero' for the sugarcane supplied by smallholder farmers. According to 2009/2010 Cane Agreement between Mtibwa Outgrowers Association (MOA) and Mtibwa Sugar Estate Limited (MSEL), rendement is regarded "zero" when its measurement is found less than 8% level, and the farmer is not entitled for any payment, instead, the farmer is obliged to pay all the services received during land preparation, crop planting, harvesting, and hauling. Charges from such services are usually carried forward and debited in the farmer's records to be resumed next harvesting season. On the other hand, more powers possessed by the millers regarding decisions over contract terms was reported by Matango (2006); URT (2006) as problem because whatever decision made in the CF arrangement was for the interest of the miller. For example, when discussion on price is not reached during contract negotiation, the miller has the power to win the dialogue and the term under discussion remains to stand in favour of millers' interests.

Lack of agricultural services has adversely affected sugarcane farming in the area. According to URT (2006); Matango (2006) during "*Shirika la Umma (SU)*" when the sugar mills were fully owned by the government, outgrowers were supported in various aspects including provision of hybrid seeds and fertilizer at subsidized prices, farming services such as tractors, harrowing, and furrowing at reasonable charges and loans from banks, free extension and other advisory services from outgrowers' advisory unit. Currently these services are no longer offered to sugarcane outgrowers (URT, 2006).

2.1.5 Assets profile

The intensity of participation in sugarcane cultivation and other non-sugarcane activities is affected by a number of factors, including but not limited to resource endowments, such as physical, human, financial, and social capita. Physical resource includes availability of land, roads, and other capital goods such as equipment required for investment. Kilombero and Turiani households own land acquired through different ways, and land is regarded as a pre-requisite for engaging in agricultural activities for both sugarcane and non-sugarcane crops.

Meanwhile, infrastructure in terms of roads and equipment such as tractors and irrigation facilities are essential elements in the area in facilitating chain development. Unfortunately, these resources are lacking among households in Kilombero and Turiani. Most smallholder farmers used hired tractors in tilling their land at higher renting charges and none of them owns irrigation facilities so depend on rain-fed agriculture (URT, 2006).

Human resource include human capital which takes the form of skills and experiences such as education level of household, labour skills, agricultural knowledge, household workforce size, age and general health of the household head and the capability to mobilize other resources (Green & Haines, 2008). Households in Kilombero and Mvomero districts where KSCL and MSEL are found, respectively have experience in farming activities, and their mean level of education according to the United Republic of Tanzania [URT] (2007) is seven years of schooling. This average level of education implies that the majority of household heads have basic primary school education.

Financial resources on the other hand are tangible or intangible assets which can be used to create value and raise access to financial capital from external sources (Green & Haines 2008). Financial resources include cash generated by profits from various activities the households are engaged in; access to credit is also a source of financing. Access to credit in Kilombero and Turiani is possible especially when there is an assurance of sugarcane output market guaranteed by the processor through contracts. Signed contracts alongside with issuance of “comfort letter” from processors can be

used as collateral (MOA Cane Supply Agreement, 2011). These documents (contracts and comfort letters) create opportunity to farmers to borrow from commercial banks such as CRDB, NMB, and other local sources like SACCOS and PASS.

2.2 Methodological approach

In order to achieve the overall objective of this study, research protocol requires that researcher should explicitly and systematically explain his/her clear cut idea on how he/she carried out his/her research. Basically, the scientific procedures of conducting research and the systematic way of analysing and ultimately presenting final conclusion can be abridged as “methodological approaches”. Methodological approach adopted by the current study follows some steps. The first and foremost steps in undertaking the current doctoral research project started by conceptualising the research topic. The topic evolved from the broad POLICOFA project title from which a narrow and manageable research topic was established. The study topic for the current doctoral research is as seen on the cover page, it reads “contractual arrangements and smallholders’ performance: evidence from Kilombero and Turiani cane growers”. The choice of the topic was preceded by literature review which enabled a deeper understanding of various frameworks valuable for the achievement of the overall goal of the research. Next to the choice of the topic was the selection of study sites. The detailed information regarding criteria for the choice of the study areas is explained in section 2.1. Next to the choice of the study sites was research design, data collection, data entry and storage followed by data analysis, and finally thesis writing.

2.2.1 Research design

The third step in undertaking the current research was to establish which research design to adopt. Research design is a framework chosen to integrate different components of the research in a coherent and logical way with focus on ensuring that the research problem is addressed (O’Connor & Gibson, 2006). Thus, this study adopted both qualitative and quantitative methods to analyse producers, buyers, and facilitators’ interviews, and survey design to carry out statistical comparative analyses, respectively. The combination of the two types of research designs was believed to provide a richer

basis for interpretation and validation of the results (Yin, 2003). The choice of the research designs was based on a number of aspects as developed by Yin (2003). That is, the type of the research questions, the extent of control the researcher had over actual behavioural events, and the degree of focus on contemporary events. With regard to the type of research question(s) under investigation, Yin argues that the form of the question can provide important signal about proper research strategy to adopt. For example, questions like *who*, *what*, *where* *how much*, or *how many* are likely to favour the use of survey or archival analysis. While questions like *how*, *why* favour case study, history, or experimental researches (Yin, 2003).

Similarly, it is argued that when an investigator has control over and can manipulate behavioural events, the experimental research strategy would be appropriate. If the investigator has no control over behavioural events, survey, archival analysis, history or case study is preferred. Concerning the “degree of focus on contemporary as opposed to historical events” Yin (2003) argues that studies focusing on current issues would be favoured by the use of survey, experiment, or case study designs.

This study focused on current issues and was undertaken in natural settings, thus had no control over behavioural events. To this end, survey (quantitative) and qualitative research strategies were appropriate. Moreover, the study was guided by “*what*” and “*why*” research questions. For instance, the first question derived from objective one asked: “what aspects of CF arrangements prevent or motivate growers from upgrading their processes?” The second question for objective two was: “what are the factors explaining why domestic sugarcane production lags behind, leading to sugar deficit in the country?” This question intended to explore whether smallholder farmers had grown their sugarcane efficiently with the available technology, if not, why? While the third objective was guided by the following questions: (i) “what extent do sugarcane growers participate in other income generating activities?” (ii) “what are the factors determining smallholder cane growers’ diversification strategies? According to Yin (2003) “what” question takes two dimensions of inquiry. First, it can justify the rationale for conducting an exploratory study whereby all five research strategies (survey, experiment, case study, history, and archival analysis) can be used. The second line of

inquiry stemming from “what” question could be in a form of “how many” or “how much” whereby survey research design can be superior to case study design. Whereas “why” question on the other hand, favours qualitative (case study and history) and experimental research designs.

2.2.2 Questionnaire construction and interview strategies

The data collection instrument may be the source of response bias. Such bias may lead to the discrepancy between the information required for a study to achieve its objective and information sought by the researcher (Daniel, 2012). According to this author, errors from the data collection instrument can be minimised by designing the instrument carefully; pretesting; mode of data collection e.g. face-to-face interview helps to control who responds when, what person in a household is eligible to participate in the interview as opposed to email or internet surveys; and training on data collection.

The questionnaire for this study was constructed to ensure that it captures valid information. Validity, both internal and external is a key issue of concern in researches. The term validity has been defined differently (see for example Kumar, 2005; O’Connor & Gibson 2006). All definitions converge to pinpoint the fact that validity is all about whether the research under study provides reliable answers to the research question which was anticipated to be undertaken, and whether the trustworthy answers were obtained from proper approaches and measures. To minimise some of the validity problems especially those related to measurement problem, this study used research tool customised from the household survey questionnaire prepared and tested by the Tanzania Bureau of Statistics under facilitation of the World Bank in the year 2004. The structure of the questionnaire and the questions contained therein typically applied to this study. It is therefore considered to be right and relevant data-collection tool.

Additionally, in order to ensure that the instrument was measuring what was designed to measure, the study had already established clear theory to guide questions those ought to be included in the instrument. The adoption of the World Bank questionnaire and the existence of a clear theory in hand helped to minimise threats that could emerge from instrument and construct validity. Furthermore, to minimise bias and vagueness arising

from adapted questions, pretesting plan was done to ensure that the questions was capturing the intended information, and the questionnaire was pretested in the study area covering thirty pre-tested respondents. Also, during interviews, research assistants and respondents were allowed to paraphrase questions to make better understanding of what were required for them without affecting the superiority of information.

Bias of the researcher through his influence in getting information that fits the theory or hypothesis under study is usually a common problem that affects validity of information. Remedy to this problem was handled through the use of multiple sources of evidence with multiple methods. Indeed, data collection tasks from these multiple sources involved more than one person to ensure reliability of information (Yin, 2003).

Other reliability problems that this study faced included the respondents' ability to remember and recall for example the total amount of income earned in the year preceding the study. This problem was minimised by asking the respondents in different ways to give the same information. For example, in determining the households' yearly total income, respondents were first asked about the activities they participated in. If the activity participated was crops cultivation for instance, the second step was to ask for the output obtained in local measurements such as kilograms, bags, "viroba"¹ and value these outputs using the respective year's price. Also, costs associated with various activities were easily obtained and subtracted from the gross sales value to get the net income from that particular activity for the respective respondent.

With regard to the authenticity of the information, it is common for respondents to give answers they think are the ones researcher is looking for and not the one required by the study itself. And sometimes they need to finish interview early and quit to attend other business. Under this situation they may provide answers which are simple, short and hard to interpret. To minimise such problems the potential respondents were informed a day or two in advance so that they could reschedule their planned activities and accommodate the interview session. Indeed, interview was conducted informally to

¹ A local name for bags with abnormal volume, normally weighs up to 150 kilograms or more, unlike normal bags which weigh 80 – 100 kilograms.

allow flexibility and freedom including some breaks during interview session when situation arise.

2.3 Data types and data sources

Literature distinguishes data types into qualitative and quantitative. This distinction is established based on the nature of the data itself. For instance, data which is in numerical form, counted, or compared on a scale can be categorised as quantitative. While those in the form of words or text, photographs, video, and sound recordings are considered qualitative data. Other categorisation is based on personal perception, for example, there are those who perceive that quantitative data are hard, rigorous, credible, and scientific. While on the other hand, qualitative data has been perceived as sensitive, nuanced, detailed, and contextual (Yin, 2003).

Furthermore, categorisation of data can also rely on who collected the data. Using this criteria, data can be categorised as primary or secondary data. For instance, when data is collected and used by the researcher himself/herself, such data is termed primary data. Whereas, data collected by someone else other than the researcher for a different purpose, and researcher used such data for his/her investigation, the data is grouped as secondary.

2.3.1 Data types

Based on the research objectives of the current study, both qualitative and quantitative data were employed. Similarly, primary and secondary data were gathered. All types of data were used in order to provide adequate evidences to support the study objectives.

2.3.2 Sources of data

Secondary data for the current study was collected from multiple sources such as: documented information from sugar processing companies' and associations' profiles; weekly, monthly, quarterly, or yearly reports regarding production data; newsletters; written contractual agreements; government documents like Sugar Act and other regulations governing sugar industry; official websites e.g. Ministry of Agriculture and Vocational training, Sugar Board of Tanzania (SBT), Tanzania Sugarcane Growers

Association (TASGA), Tanzania Sugar Processors Association (TASPA), including Food and Agricultural Organisation (FAO) of the United Nations.

Likewise, primary data was collected through face to face interview administered to the household heads who grow sugarcane; to processors; to key informants from the Ministry of Agriculture and Vocational Training, TASGA, SBT, Growers' Associations/ Cooperatives and farmer group leaders.

2.4 Data collection methods

The fourth stage of research process for this study was data collection. This stage involved two phases of data collection, phase I and II. Methods of data collection adopted include in-depth interviews, observations, and documentation.

2.4.1 In-depth interviews

Phase I

Phase one was designed for the qualitative analysis of specific research objective 1. It involved an in-depth interview to the selected respondents from the first two nodes of sugar value chain, that is, production and processing nodes. It was a purely qualitative study aimed at evaluating the role of contract farming arrangements in facilitating smallholder sugarcane outgrowers' upgrading their production processes. Data collection was conducted twice during this phase. The first period of data collection started in June and ended in July 2011. This was a pilot study intended to serve two purposes, first to familiarise the researcher with study area's environment and second to collect data.

The interview guide used to collect data during period one in phase I was developed with the assistance from the senior researchers at Mzumbe University. The instrument aimed at collecting information pertaining to the role of individual actor in the management of contract farming arrangement; information on how contract was formulated, negotiated, and implemented including actors' involvement and capacity; perception on their understand of the terms of the contract. Other information included opinion on pricing and timing of payment, opinion on the overall sugarcane production

trends for the past 10 years and perception on efficacy of harvesting, loading and hauling equipment. Information on the efficiency of mills operations and perception on the effectiveness of contract enforcement was also gathered.

Likewise, during period two (phase 1), in-depth interviews were conducted between May and June 2013 using unstructured open ended interview guide prepared under the guidance of two senior researchers and professors from Copenhagen University (Denmark). Data collected include general information on memberships in the associations; functions/tasks of the associations and farmer groups covering issues on service provision and access to credit; information on training and advice to the leaders and members. That is whether they received training or advice in various aspects such as land preparation, seeds, planting, weeding, fertilizer application, pest management, harvesting operations (cutting, loading, and hauling) and from whom the training/advice were obtained; crop management (extension) and farm management (work-plan, economic planning); information on contract which covered advantages, disadvantages, actors' influence on contract, aspects of contract which have been easy to handle and those which were difficult; most important changes since the start of formal contract system; understanding of price determination, measurement of rendement, opinion on price calculation (fair, unfair, don't know and why); information on the cooperation with others such as TASGA, local associations, NGOs, government institutions; and financing information (own resources, bank, miller or other). Although depth interview using unstructured instrument is considered superior over other methods especially when the aim is to explore and uncover sensitive matters, deep seated emotions, motivations and attitudes, yet the current study adopted it with caution. The method is likely to give elusive and even misleading responses, hence to minimise such shortfall and make this method effective, researcher followed the principles suggested by Sue-Chan and Latham (2004). Among others the researcher used familiar words and avoided to appear superior, questions were asked indirectly and informatively, all questions that would lead to "yes" or "no" responses were avoided, and researcher created conducive environment to encourage respondents to feel free when responding to the question posed.

Phase II

Phase II was a survey conducted using structured questionnaire administered on face to face personal interviews from July to August in 2012. This phase aimed at collecting data for quantitative analysis of specific research objective 2 and 3 of this study. The quantitative data collected was mainly used in the econometric models to estimate profit efficiency (objective 2) and to measure income diversification (objective 3).

The data collected were for the 2011/12 farming season. The sample survey and general administration of the face to face interview was carried out with the help from enumerators. Four enumerators (two females and two males) were recruited by POLICOFA project to work with the researcher. Three of them were graduates of Mzumbe University and one was from Sokoine University of Agriculture (SUA). These enumerators were selected based on their knowledge on farming system and experience in data collection exercise. They were in addition given training intended to make them conversant with the questionnaire, equip them with skills of the data collection, how to approach and clarify questions to farmers and skills on how to record the data properly before conducting the formal survey. Prior to actual data collection, the trained enumerators pretested the questionnaire by interviewing thirty sugarcane growers from two villages in Turiani, namely Kidudwe and Lungo. Thereafter, the outcome of pretesting exercise by each enumerator was discussed in group so that all enumerators would benefit from the discussion. This greatly helped to improve the questionnaire used to generate data and it helped to have clear and common understanding of the questions.

The data collected during phase two includes information on household demographic characteristics; all activities related to sugarcane production such as planting, input purchase both by cash and on credit, input voucher payment system, source of labour, farm implement and machinery, extension services, access to credit, CF participation, and crop sales. Other information included household income from sugarcane and other crops than sugarcane; participation in off farm employment activities such as migration, wage jobs, and self-employment activities; and income derived from these activities.

The questionnaire had also a section seeking information on asset endowment and wealth of the household.

2.4.2 Documentation

Likewise, documented information from sugar processing companies and associations' profiles, newsletters, written contract agreements and weekly, monthly, quarterly, and yearly reports regarding production data were reviewed. However, some documents pertaining to the profit and loss accounts were treated as confidential documents. Thus, it was unfortunate that the researcher could not get access to them.

2.4.3 Observations

Direct observations were made during field visits to smallholder farms, dwellings and factory estates. Observations in the associations' offices and yards for farm implement as well as sugar processing factory premises were also done. Since the visit was conducted during harvesting season, researchers had the opportunity to witness harvesting process and harvesting tools used. This information was important in understanding the overall dynamics of CF arrangements and its influence on outgrowers' performance.

2.5 Target population and sample selection

It is usually necessary to identify the target population first before considering sampling strategy. As pointed out earlier, the current study was focusing on individual sugarcane outgrowers under contract in Tanzania as the unit of analysis. Therefore, two ideal places (Kilombero and Turiani) were selected for the study. According to the Sugar Board's Register for outgrowers (July 2012), Turiani area had a total of 8894 fully registered members of which 2798 (31.5%) were fully registered inactive members.

In Kilombero area, the fully registered members were 16,043 making a total of 24,937 outgrowers in both areas. Similarly, the key informants were also included in the study and were individuals responsible for making decisions on matters related to sugarcane cultivation. Such individuals included top management of the outgrowers' associations/cooperative, owner-managers of the sugarcane processing factories, and representatives

from government institutions such as Ministry responsible for sugar sector, and Sugar Board of Tanzania.

2.5.1 Sampling frame

The sample used for this study was drawn from the population classified above. List of the registered sugarcane outgrowers are readily available at each association's office, and the list of registered associations are made available at the factory's office. Equally, the list of farmer groups was found at the association's office. Therefore, it was easy to find all respondents intended for this study.

2.5.2 Sample size

Determination of the number of individuals, objects, or units of analysis for the study is often among difficult steps in the entire research process. Basically, there exist some debates regarding acceptable sample size for carrying out a scientific study. Following this debate many studies have evolved trying to establish some criteria for determining adequate sample size; see for example Lenth (2001); Patton (2001). Similarly, there is a growing efforts in software development such as Power and Precision (Borenstein, Rothstein, & Cohen, 1997); nQuery Advisor (Elashoff, 2000); and statistical packages like SPSS, MINITAB, SAS; including web resources and online calculators for sample size determination (Lenth, 2001; Hoenig & Heisey, 2001). Also, many books in statistics contain tables that can be used to calculate sample size. In general, literature suggests that sample size depends on the type of research design adopted. For example, quantitative studies strive for generalization of the entire population and thus, large samples are preferable as opposed to qualitative studies which small sample is sufficient for carrying out a study (Patton, 2001; Yin, 2003). This study adopted both qualitative and quantitative study designs, therefore, two sets of sample size were estimated based on the criteria established for each research design.

2.5.2.1 Sample size for qualitative analysis

This study employed four units of analysis with a total of 59 respondents. The detailed information on the categories of units of analysis and sample size is summarised in

Table 2.1. Selection of sample size was based on the criteria for estimating acceptable sample size for qualitative research established by Patton (2001). That is, (i) sample size should reach saturation (a sample size that leaves no more new concepts coming out); (ii) sample size should base on the approach of the study or data collection methods used. Patton (2001) suggests that for case study and biography, a minimum of one case or one person can be used for the study. But for phenomenology 10 people can be employed, however if saturation is reached before this number, the researcher can use fewer. Whereas for grounded theory, ethnography, or action research, 20-30 people can be used, which is typically enough to reach saturation.

Based on data collection methods, Patton (2001) argues that interviewing key informants needs approximately 5 people, and in-depth interviews require approximately 30 people. Whereas for focus groups, researcher should create groups that average 5-10 people each, and the number of groups would depend on the research question. Ethnographic survey on the other hand, needs large and representative sample comparable to those in quantitative study (Length, 2001). In the similar vein, this study employed a small sample size for the qualitative analysis since it was an exploratory research in which large sample was not necessary.

Thus, this study conducted in-depth interviews to individual cane growers and key informants who included owners of the processing factories, representatives from facilitating institutions such as farmer organisations, ministry of agriculture, and sugar board of Tanzania. Selection of farmers were based on the farming and harvesting zones, whereby each zone from each village was represented by two farmers who were engaged in the sugarcane cultivation for the past 12 months from the day of interview. The list of farmers for each zone was readily available at their respective associations' headquarters as well as at village levels. Four villages visited included Kitete and Kidatu for Kilombero, Kilimanjaro and Lungo for Turiani.

Table 2.1: Study units

S/N	Unit name	Category	Number	Location
Unit 1	Producers	Smallholder Farmers	8 @ village	4 – villages named above
Unit 2	Groups	Smallholder farmer groups	9	Kilombero - 6 & Turiani-3
Unit 3	Processors	KSCL (Illovo)	1	Kilombero
		MSEL	1	Turiani
Unit 4	Facilitating Institutions	Associations/ cooperatives	14	Kilombero 12 & Turiani 2
		Sugar Board of Tanzania	1	Dar Es Salaam
		Ministry of Agriculture.	1	Dar Es Salaam
Total			59	

Source: Researcher's identification from the study area, 2012

Producers in this study were smallholder sugarcane outgrowers chosen based on the information from the survey results. They also represented actors in the first and foremost node in the value chain who agreed that they were involved in the contractual arrangement in the last twelve months from the date of interview, and who were obliged and willing to intensify cane production and sell all of their annual sugarcane production to the processing factory. The sample was taken from all harvesting zones, whereby at least two respondents from each zone in both areas of Kilombero and Turiani were chosen.

Farmer groups were also included in the study because the organisation of the contract farming arrangements starts from the farmer-group leadership. The role of the farmer group includes the follow-ups of the services provided or supposed to be provided by the association. In this context six farmer groups from Kilombero and three from Turiani were visited, namely Kitete, Upendo, Harakati, Mkanyageni, Mwangaza, and Sunguburu, for Kilombero; Kilimanjaro (MOA), Kilimanjaro (TUCO), and Lungo (TUCO) for Turiani.

Processors were purposely included in the study because they were sole buyers of sugarcane produced by smallholder cane growers. They are key players in facilitating upgrading opportunities in the value chain literature, and represent the second node in the structure of the global value chain. Kilombero sugar company limited (KSCL – ILLOVO) and Mtibwa sugar estate limited (MSEL) were purposely selected based on the merits discussed hereunder.

KSCL – ILLOVO is the largest sugar processing factory in the country and it practices outgrowing scheme with small, medium and large scale farmers. It was established in 1962 and as of now it has public-private ownership status at a ratio of 25% government ownership and 75% is under private ownership. On the other hand, MSEL was established in 1963, and it is a private company with 100% ownership. MSEL involves smallholder farmers to supplement its own sugarcane production to meet the factory capacity. It ranked the third out of four major sugar processing companies in Tanzania.

Facilitating institutions selected for the study were farmer associations/ cooperatives, central government (ministry of agriculture), and SBT. They were chosen based on the roles they play to assist smallholder farmers when executing their farming activities and other obligations emanating from the contracts. Some of the responsibilities of the associations/ cooperatives are: (i) they act as guarantor for the outgrowers to secure loans from financial institutions and or from other money lenders like SACCOS, (ii) offers extension services to farmers through agricultural extension officers employed by associations and those from central government, (iii) offers farming and harvesting services to farmers, (iv) offers advocacy and lobbying services to farmers, (v) represents outgrowers in formation and negotiation of contract terms. Generally, associations have the role to strengthen the position of the smallholders in the farm input and output markets and giving smallholders a voice in the policy process (Bijman & Wollni, 2008). The following were some of the associations/ cooperatives included in the study and were selected based on the size in terms of number of registered and active members.

Ruembe Cane Outgrowers Association (RCGA) was formed on May, 22nd 1992, with 3507 registered out-growers up to the date of interview (July/ August 2012). It was the largest association in Ruembe area with 72% share of total volume of sugarcane delivered to the factory in aggregate of all associations in the area, and the rest 28% was shared among other four small competing associations, namely; Muungano Cane Growers Association (MUCGA), Msindazi Cane Growers Association (MCGA), Bonye Cane Growers Association (BSGA), Maendeleo Cane Growers Association (MACGA).

Kilombero Cane Outgrowers Association (KCGA) was formed in June, 14th 1992 at Kidatu area, and it has 3500 registered outgrowers at the day of interview (July/ August

2012). It was included in the study because it was the largest association in Kidatu area. KCGA competes with other nine small associations, namely; Msolwa Ujamaa Cane Growers Association, Mang'ula Cane Growers Association, Kidatu Ikea Cane growers Association, Msolwa Station Nyange Cane growers Association, Sanje Cane Growers Association, Mwangani Mtendezi Lukoga Cane Growers association, Muungano Cane Growers Association, and Harambee Cane Growers Association.

Mtibwa Outgrowers Association (MOA) is an association established on 24th July, 1996. It was the only cane growers association in Turiani division with 6300 registered cane out-growers at the date of interview (July/ August 2012). On the other hand, Turiani Cane Out-growers and other Crops Primary Cooperative Society Limited (TUCOCPRICOS LTD) is a cooperative established in October, 2006, with 3000 registered members up to July/August 2012. It was chosen because it was the only cooperative registered in Turiani division dealing with smallholder sugarcane growers. Therefore, each unit of analysis in the current study was selected based on its own peculiar merits in the sugar value chain. It can be observed that the units involved were purposely drawn from the first two segments of the value chain instead of assessing the entire sugarcane value chain. It was done so to narrow the study focus.

2.5.2.2 Sample size for the quantitative survey data

As explained earlier on, sample size is determined by the type of data analysis to be adopted. Each type of analysis has rules of thumb established to guide researchers in obtaining successful and meaningful size of the units under study. Lenth (2001) argues that apart from the measurement error emanating from unreliable instruments adopted or inappropriate selection of population under study, determination of adequate sample size relative to the goal of the study has also been an important step in planning statistical studies such as surveys, experiments, or observational studies.

Practically, sample size may be determined based on either precision analysis or power analysis. According to Chow, Shao, and Wang (2008), precision analysis and power analysis for sample size determination are usually performed by controlling type I error and type II error, respectively. Based on the importance of type I and II errors in

research, Lenth (2001, pp. 187-190); Chow, Shao, and Wang (2008, p. 16) discussed criteria involved in determining sample size and suggested what researchers should do. Some of the proposed procedures include the following: first, researcher should define the formal hypothesis i.e. specify a hypothesis or claim he/she feels needs to be tested and set a criterion upon which he/she decides the claim tested is true or not; second, specify the significance level of the test; third, specify an effect size that reflects an alternative of scientific interest; fourth, obtain historical values or estimates of another parameters needed to compute the power function of the test; and finally, specify target value of the power of the test.

These criteria are usually used to determine sample size with the help of appropriate software without technical difficulties. The emphasis of the Chow et al. and Lenth's discussion on sample size determination is based on power approach, in which the effect size the researcher wants to detect is extremely important based on the observed size of the power. Normally, increase in power leads to an increase of the effect size, and eventually increase of the sample size – the larger the sample size the more likely to obtain the true difference (Lenth, 2001; Chow et al., 2008).

Unlike in the power analysis, under precision perspective, the issue of addressing the effect size is of less importance. The issues of concern in determining sample size under precision analysis include the following: the researcher should specify the level of confidence that is, how confident the researcher wants the actual mean to fall within the confidence interval; specify variance of the outcome index; and maximum error or margin of error which determines how much high or low sample mean falls relative to the population mean (Borenstein, Rothstein, and Cohen 2001). Thus, bestowing to Chow et al. (2008), the required sample size given the maximum possibility of committing type I error when population is infinite can be estimated using the following expression:

$$n = \frac{z_{\alpha/2}^2 \sigma^2}{E} \quad 2.1$$

Where; α is the level of significance i.e. the maximum probability of committing a type I error the researcher can tolerate, E is the maximum error of an estimate of the unknown parameter, and σ^2 is the variance or margin error, the level of willingness to allow the

sample mean to be located, and n is the sample size. Based on the expression 2.1, sample size can be estimated for a study with 95% confidence that the error in the estimated mean is less than the standard deviation, standard deviation for prior survey set at 50% for safe decision, and margin of error of 5%, can be determined as follows:

$$n = \frac{Z_{\alpha/2}^2 \sigma^2}{E} = \frac{(1.96)^2 (0.5)^2}{0.05^2} = 384.16 \approx 385$$

When population is known, sample size determination equation 2.1 changes and becomes:

$$n = \frac{n_0}{1 + \frac{n_0}{N}} \tag{2.2}$$

Where: n_0 represents sample size when population is infinite; N represents the size of the study population. For the case of sugarcane outgrowers, population is known, $N=24937$, thus, using the sample size estimated from hypothetical example, equation 2.2 yields the following sample size:

$$n = \frac{n_0}{1 + \frac{n_0}{N}} = \frac{384.16}{1 + \frac{384.16}{24937}} = 378.33 \approx 378$$

Thus, sample size determination whether through power analysis or precision analysis depends on the research objective. If the objective is to compare effects of treatment between control and treatment groups, power approach is more appropriate. But for the other studies without treatment evaluation, precision analysis should be adopted (Chow et al., (2008)). Consequently, the objectives of the current study were first to analyse profit efficiency among smallholder cane growers, and second determine the intensity of income diversification among sugarcane growers. Thus, precision approach was preferred, which guaranteed to have sample size of 400 respondents, 200 from each location.

2.5.3 Sampling techniques

In order to obtain an accurate sample size which is true and appropriate vehicle for gathering information, a researcher requires considerable effort to ensure a true representation of the population. Various methods can be used to obtain a sample for the study, but selection of the method normally takes into consideration minimisation of the

sampling error. Though in practice sampling techniques are classified under two main categories, namely probability and non-probability sampling, the decision to use either of the methods depends on many aspects including the research design employed. Since this study adopted both qualitative and quantitative study designs, likewise, both probability and non-probability sampling techniques were employed.

2.5.3.1 Non-probability sampling

Non-probability sampling involves selection of population elements based on their potential characteristics. This sampling technique is mainly influenced by researcher's personal judgment, hence there is a possibility of leaving some elements of the population uncovered, and thus making it difficult to establish generalisation of the entire population. According to Yin (2003), four common types of non-probability sampling techniques are used in research, namely convenience sampling; purposive (judgmental) sampling; quota sampling; and snowball. Convenience sampling involves selecting units of analysis that are most convenient. While purposeful sampling is concerned with obtaining a sample based on the individual judgment about sample member's characteristics required for the study, snowball is concerned with obtaining additional respondents through the information provided by the earlier respondents.

Amongst subcategories of non-probability sampling explained above, the current study adopted a combination of judgmental sampling and snowball in selecting study elements for the qualitative analysis. Judgmental sampling was first of all applied in selecting study sites, Kilombero and Turiani. The two areas were purposely selected since they were the only places in Morogoro and Tanzania in general where sugarcane farming was conducted under contract farming scheme. Next to the selection of study sites, was the selection of four big farmer associations (KCGA, RCGA, MOA, and TUCOCPRICOS). Two associations (KCGA and RCGA) were from Kilombero, and the other two (MOA and TUCOCPRICOS) from Turiani. The selection of growers' association in each study site was based on size in terms of number of registered and active members and the volume of produce. Likewise, the selection of various key chain actors such as smallholder cane outgrowers and owners of the processing factories including key

informants from facilitating institutions such as farmer organisations, ministry of agriculture, and sugar board of Tanzania were purposively done. Selection of farmers was based on plot size, farming and harvesting zones.

The current study considered plot size less than 15 hectares. Four harvesting zones were distinguished, namely zone I which covered farms located 0-5KM away from factory gate; zone II (6-10KM); zone III (11-15KM); and zone IV beyond 20KM. Each zone was represented by two farmers engaged in the sugarcane cultivation for the past 12 months from the day of interview. We walked around the villages guided by farmer group leaders with the list of farmers at hand collected from associations' office. With the help of farmer group leaders, it was easy to locate the potential farmer for the first interview. Next respondents were identified through snowballing, i.e. by using information from the last interview together with farmer group leaders. Apart from farmers, we also interviewed leaders from farmer groups originating from the first big four association of outgrowers in the study areas. Selection of the farmer groups was based on the location. Those groups located in the areas where we could find farmers belonged to all categories of harvesting zones were purposely selected for the study. Thus, Kitete and Upendo farmer groups located in Kitete village were selected because they belonged to Ruembe Cane Growers Association (RCGA), one of the biggest associations in Kilombero and had farmers with farms located in all zones. Similarly, Harakati, Mkanyageni, Mwangaza, and Sunguburu farmer groups located in Kidatu were purposely selected on similar merits. In Turiani, farmer groups such as Kilimanjaro (MOA), Kilimanjaro (TUCOCPRICOS), and Lungo (MOA) were purposely selected because they were located in areas where farmers belonged to different harvesting zones were found.

2.5.3.2 Probability sampling

Probability sampling is a technique used to obtain elements of the sample from the population of the interest, whereby, individual elements have equal chance of being included in the sample (Daniel, 2012). There are several probability sampling techniques that were used in research, namely simple random sampling, systematic random sampling, stratified sampling, cluster sampling, and multistage random sampling (Chow,

Shao, & Wang, 2008). Each technique has strengths and weaknesses. For the analysis of profit efficiency and income diversification objectives of this study survey data were obtained from a sample selected through probability sampling technique. Outgrowers were randomly selected from four associations in Kilombero and Turiani. Whereby, 100 respondents were selected from each association in each village. In Kilombero, Kidatu and Kitete villages were surveyed to obtain KCGA and RCGA members respectively. Likewise, Kilimanjaro village and Lungo village were visited in Turiani to obtain 100 respondents from MOA and TUCOCPRICOS. Outgrowers with plot size greater than 15 hectares, and inactive members were all excluded. Study population was limited by plot size based on the overall study objective, which focused much on the performance of the smallholder sugarcane outgrowers. Undoubtedly, smallholder farmers are defined differently in different countries, but Jayne, Mather, and Mghenyi (2010) in their study on principal challenges confronting smallholder agriculture in Sub Saharan Africa, and survey undertaken in Ethiopia, Kenya, Mozambique, Rwanda, and Zambia, their sample size excluded households farming more than 10 hectares.

2.6 Data analysis

The type of data analysis the researcher should adopt would depend on research design employed for the particular project. For instance, qualitative research design normally leads to qualitative data analysis. Likewise, quantitative research design is favoured by the corresponding quantitative data analytic approaches. The current study adopted both qualitative and quantitative research designs. Thus, both qualitative and quantitative data analytic approaches were adopted.

2.6.1 Qualitative data analysis

Performing a qualitative analysis involves undertaking some peculiar preliminary steps. Such steps depend on the methods used to collect data. O'Connor and Gibson (2006) for instance, argue that data collected through in-depth interview and responses recorded by interview tapes, researcher needs to listen to the tapes, transcribing the interview from the tape to the paper and read over the written transcripts. Similarly, if the responses from the interview were recorded direct to the paper by the interviewer, then the

researcher is obliged to read between lines to grasp the general message coming out. Likewise, researcher may type the text from observational notes or memos into word processing document, the stage often known as data entry and storage.

After the preliminary data entry and storage stage, O'Connor and Gibson (2006) have summarised steps in analysing qualitative data as follows: first, data should be organised. Organisation of the data involves arranging responses through each topic to pick up concepts and themes. Second, searching and organising ideas and concepts, which involves coding and categorising ideas and concepts. Third, building over-arching themes in the data. This involves merging of different categories under one main arching theme. Fourth, ensuring reliability and validity in the data analysis and in the findings. This involves triangulation of methods, that is, the same question or topic being answered by different research methods such as survey, focus group, individual interview; corroborating the findings; or interviewing different members of the community on a specific question or topic. The fifth and final step is to explain the findings by comparing the results with literature, and their general implication.

The current study adopted similar procedures whereby interviews and observational notes were entered and stored in the computer in the form of text. The data was then deduced by aligning emerging themes with the pre-developed² category systems. As opposed to O'Connor and Gibson (2006) regarding category development, this study divided data into meaningful analytical units, which were then assigned to the corresponding category and subcategory names established before. Next to the coding stage was data enumeration stage whereby the current study attempted to summarize, organise and quantify the data. Quantifying data helps to clarify words that have been used in this report such as “a few” or “almost all” since quantification was done in percentages as well as in frequency counts. Subsequently, results were corroborated and validated by comparing them with the results from other units of analysis interviewed on the same topic. Validation of the current study's result was done by comparing responses of smallholder cane growers with the perceptions from other different

² Pre-developed category is called priori code/category. The priori codes are codes developed before examining the current data (O'Connor and Gibson, 2006).

members of the community on the same questions. The key informants used as judges include farmer group leaders, representatives from top management of farmer associations, representatives from government agencies that is, Sugar board of Tanzania and Ministry of Agriculture, Food Security and Cooperatives. Ultimately the results were compared with the literature to establish a base for drawing the implication of the findings.

2.6.2 Quantitative data analysis

Data analysis in phase II involved performing descriptive statistics and model estimation using STATA 11 software. As explained previously, data analysis is a process involving a series of steps. The first and foremost basic step is data entry into computer software for analysis, check for errors and data quality and carrying out descriptive statistics. Stochastic profit frontier function and Tobit regression were analysed through maximum likelihood estimation (MLE). Variables used and estimation conditions and procedures are discussed in detail in chapter four and five, respectively.

2.6.2.1 Descriptive analysis

Descriptive analysis for specific objectives two and three involved analysing the social economic characteristics of sample households, and ranking of farmers' responses with regards to certain questions. Also, factors influencing smallholders' efficiency (for the objective 2 which forms chapter four) and factors influencing farm households' income diversification (objective 3 which forms chapter five) were described using descriptive statistical tool. Descriptive analysis involved calculating frequencies, percentages, means, min., max., and standard deviation using STATA 11.

2.6.2.2 Econometric models

Two econometric models were employed for objectives two and three of this study. The first was Cobb Douglas stochastic model for objective two, to analyse factors influencing profit efficiency of smallholders in the study area. The variable used to measure efficiency was the normalised profit per farm, which is a continuous variable. The second model was Tobit regression used to analyse covariates of income

diversification and its intensity. Equally, the marginal effect in Tobit equations takes into consideration the fact that a change in an explanatory variable affects simultaneously the number of sample farmers diversifying their activities and the extent of diversification (Mesfin et al., 2011). Likewise, variables used to measure participation in various income sources were incomes from diversified activities, and the variable used to measure the overall income diversification was the Shannon equitability index which ranges from 0 to 100 in percentages. Both measures of diversification are continuous variables analysed using STATA program version 11.

CHAPTER THREE

CONTRACTUAL ARRANGEMENTS AND UPGRADING POSSIBILITIES OF SMALLHOLDER SUGARCANE GROWERS

3.1 Introduction

This chapter responds to whether contract farming (CF) influences process upgrading, which was the study's first objective. The main assumption governing this study objective was that farmers in the contract were likely to experience some upgrading. Because contract is assumed to provide capability and incentive parameters for process upgrading to smallholder farmers. To achieve this objective, the following research question was addressed: what aspects of CF facilitate or obstruct process upgrading? In responding to this question, the chapter is organised as follows: Section 3.2 provides some background information. Section 3.3 describes the literature review on contract farming, upgrading concept, and the link between contract farming and upgrading, followed by empirical evidence and conceptual framework. Section 3.4 covers methodological issues, such as sample size and sampling procedures, data collection methods, data analysis and management methods. Section 3.5 examines the various factors influencing upgrading, and Section 3.6 concludes the chapter.

3.2 Background information

Sugarcane is one of the priority commercial crops in the tropics and subtropics, which serves as the main source of raw material in sugar production. Sugarcane accounts for about 70% of sugar produced globally and the remaining 30% of sugar produced comes from sugar beet (Verdonk, Dieperink & Faaija, 2007). For the 2011/2012 marketing year, sugar production was globally forecasted at 168 million metric tons (MMT) gross value, while global consumption was forecasted at 159 MMT (USDA, 2011). These statistics indicate that there is excess supply over demand for sugar.

However, in developing countries, like Tanzania the situation is reversed. Tanzania is a sugar deficit country with four large estates producing about 300000 tons of raw sugar annually, leaving a short fall of 220000 tons to be met by imports (Southern Agricultural

Growth Corridor of Tanzania [SAGCOT], 2012; Rabobank, 2013). Under performance of the sugar sector, as it is for all other sectors of the country's economy, is a historical phenomenon in existence since country's independence (1961). From the independence year to the period of 1980s, there was economic crisis associated with low productivity, declining growth, fiscal crisis, balance of payment crisis, hyperinflation, deterioration of social services, and debt crisis which necessitated both paradigm and ideological shifts (Nkya, 2003; Rabobank, 2013). As result the country initiated various policies and strategies to overcome those crisis such as, public sector reform, private sector development, financial reform, fiscal reform, and economic stabilization (Nkya, 2005). Others included policies and strategies focused much on agricultural sector development. However these initiatives did not meet the country's expectation (Nkya, 2005).

Adoption of these initiatives subjected the Tanzanian economy to global competition. Such competition necessitated producers to meet requirements for product standardisation in the global market. Consequently, the requirements created pressure for the need to improve performance and competitiveness in various sectors of Tanzanian economy. But, for Tanzanian producers to compete in the global market, literature on competitiveness suggests that the most viable response to globalization is to upgrade production processes, product, or functions (Humphrey & Schmitz, 2002).

Several studies such as new economic geography, business studies, regional science, and innovation studies have explained determinants of upgrading viewed from two main approaches: industrial clusters; and global value chain (Humphrey & Schmitz, 2002; Ponte, 2009). Under industrial clusters perspective, upgrading is determined by assimilated "capabilities for upgrading" built through local linkages, whereby the acquisition of "knowledge" (one among indicators of capability for upgrading) is transmitted through local interaction (Ponte, 2009). Global value chain (GVC) approach on the other hand, takes a different line to the question of determinants of upgrading. The GVC perspective emphasises on upgrading enhanced by capabilities built through knowledge generated by cross-border linkages between firms in global production and distribution systems. In this situation, the knowledge is transmitted through buyer-

supplier relationships rather than through local linkages (Humphrey, 2004). The accumulated knowledge through buyer-supplier partnerships forms the bases for capability building. Similarly, other studies have used both capabilities and incentives as parameters for assessing firms upgrading possibilities (see for example Humphrey, 2004; USAID, 2006; Ponte, 2009).

However, some literature have questioned to whether buyer-supplier interaction can facilitate transmission of tacit knowledge to suppliers (see for example Hazell, Poulton, Wiggins, & Dorward, 2010; Gibbon, 2001 for cotton and fish chains in Africa). According to Hazell et al. (2010) upgrading process depends on the following: (i) who drives the chain; (ii) supplier's capability to undertake a particular function; and (iii) lead buyers' strategies.

Pertaining to lead buyer's strategy, this may favor or disservice suppliers' competence due to the fact that it depends on the buyers' mission in coordinating the chain. Lead buyers may strategically coordinate the chain by reinforcing or enhancing barriers to entry by allowing suppliers to institute measures which reduce costs and risks while increasing the speed and reliability of supply (Gibbon, 2001). Likewise, according to Gibbon, lead buyers may indeed set rigidly exploitative terms to suppliers and hence directly or indirectly downgrading the suppliers. Moreover, Chry, Taylor, and Hui (2008) argue that lead buyers may limit suppliers from all activities which are the core competencies of the buyers such that knowledge/skills related to those activities are not transferred to the suppliers.

With regards to who drives the chain, studies have realized that there are some lead buyers who limit suppliers to some functional levels, such that they tight and retain them in the lower profit functions (Chry *et al.*, 2008; Navas-Aleman, 2011). Similarly, Humphrey (2005) notes the possibility of producers in developing countries being trapped in narrowly confined value chain activities with low skills and low returns.

Capability in undertaking a particular function is also crucial for upgrading. Capability means the power to make viable decision at right time (USAID, 2006). There are cases reported in fruits and vegetable production regarding the role of suppliers' capability in

meeting buyer's requirements. In fruit and vegetable production local suppliers were able to fulfill the requirements specified by supermarkets using "just-in-time" model of delivery. Suppliers were required to deliver tested, prepared, packed and bar-coded products within 24 hours. This was possible because suppliers had capability, without which they could have been difficult for them to meet the buyers' specifications. In contrast, cocoa producers in Indonesia experienced downgrading due to failures to meet quality specifications (USAID, 2006).

In developing countries like Tanzania, the ability of small-scale farmers to upgrade is constrained by many challenges which include: poor access to and low usage of improved seeds and fertilizers; under investment in productivity enhancing technology; limited access to financing for uptake of technologies; inappropriate technology; poor coordination and limited capacity; dependency on unreliable rain-fed agriculture; limited use of available water resources for irrigated agriculture; institutional and market failures (missing markets, incomplete markets, information and information asymmetry) (Savris, Savastano, & Christiaensen, 2006); URT, 2010); Ngaiza, 2012).

Taking together the challenges, Contract Farming (CF) has been considered as one of the strategies geared towards enhancing production and marketing of agricultural commodities in Tanzania (URT, 2010). In Sub-Saharan Africa there is an increasing trend in adopting CF (Prowse, 2012). For example, in Mozambique 12% of rural population is involved in CF, Kenya 50% of tea and sugar are produced under CF (Swinnen & Maertens, 2007). Literature also indicates that CF offers to farmers various services such as production inputs, remunerative prices, and exercises some control at the point of production and directly shapes the production decisions through specified obligations e.g. volume, value, and quality (Little & Watts 1994). Similarly, CF reduces transaction costs and risks to farmers (World Bank, 2007; Bellemare, 2012).

Thus, these benefits offered by CF arrangement generate "capabilities" and "incentives" to farmers in undertaking an activity. According to Prowse (2012), CF benefits or opportunities include provision of credit, input, and production services such as seed, fertilizer, training, extension, transport, and land preparation. CF also provides technical knowledge, technical assistance and skills transfer (Guo & Jolly, 2009). These

opportunities emanating from CF arrangements build the capability of the farmer in undertaking production activities. The incentive opportunities on the other hand include provision of guaranteed and stable pricing structure, access to reliable market, and supports farmers to meet standards (Prowse, 2012). Therefore, CF in the perspective of those studies have been instrumental in enhancing growers' both capabilities and incentives to improve production and access reliable markets in the value chain, respectively.

Irrespective of the roles it plays, CF scheme has stimulated active debate in the literature on its merits to the marginalised groups, especially the rural poor community. The source of debate rests in the power and capability differences among actors in the organisation of the arrangement. Power in the global value chain perspectives implies the ability to influence individuals or groups to decide or act as wished by power holder. Such power may distort negotiation process and implementation of contract. Several studies have revealed that lack of enforcement as a result of power differences in the CF arrangement has been a source of contract failure (M4P, 2005). Others have documented the weaknesses of CF on the grounds of exploitation (Gibbon & Ponte, 2005; Bernstein & Campling, 2006). On the other hand, Reardon and Barrett (2000) argue that CF typically displaces decision making authority from the farmer to the downstream processor turning farmers into pseudo employees. Sivramkrishna and Jyotishi (2008) noted positive impact of CF on growers' poverty status being negligible due to monopolistic exploitation.

From the foregoing discussion, it is evident that CF commands greater disagreements across studies regarding its role on influencing smallholders' performance. That is why the current study was motivated to assess the influence of CF on the process upgrading of smallholder farmers in Tanzania. By taking into consideration that CF has been practiced in Tanzania, particularly in the sugarcane subsector since 2006. It evolved from traditional outgrowers' scheme that existed since 1960s. Introduction of contract farming (CF) was a response to privatisation and market liberalisation of the sector. To date sugarcane production in Tanzania is not performing satisfactorily and sometimes with declining trend especially for outgrowers (SBT, 2011). According to Rabobank

(2013), in the year 2013 production stands approximately at 27 tons/ hectare on average instead of 40 tons/ hectare standard yields for outgrowers' rain-fed sugarcane. As a result sugar sector is now characterized by sugar deficit made up through imports (Nkonya & Barreiro-Hurle, 2012).

The challenges of CF arrangement on influencing smallholders' performance worldwide, Tanzania inclusive, prompted this study to take a closer look at the influence of CF on cane growers upgrading possibilities in Tanzania. Based on our understanding, few studies have been conducted to identify factors influencing performance of sugarcane subsector in Tanzania. Most of these studies have overlooked or ignored the role of CF on farmers' upgrading. For example, a study commissioned by then Ministry of Agriculture Food and Cooperative (MAFC) and final report submitted in November 2006, among others reviewed the status of contract farming arrangements in Tanzania, covering more than 20 commodities. Sugarcane was among the crops covered, but the focus was on the power of farmers' organisation under outgrowers' scheme in Mtibwa. In 2006 when the study was conducted, cane growing was still operating under the traditional outgrowers scheme, the use of contracts was not yet established in Mtibwa, and the study could not assess CF per se. Equally, Nkonya and Barreiro-Hurle (2012) pointed out factors behind sugar industry performance focusing on two main aspects; first, they assessed the incentives and disincentives of sugarcane producers in the United Republic of Tanzania using price incentive through benchmarking domestic sugar prices against international market prices, and second, by using trade policies affecting commodities. So far little is known about the role of CF on farm performance in the area.

Therefore, there is a need to understand the influence of CF in enhancing upgrading given that currently there is global competition in primary commodities as an upshot of privatisation and liberalisation policies. Such global competition calls for upgrading to small scale and large producers. Several studies worldwide and across sectors provide empirical evidence of the importance of upgrading to SMEs, particularly in the agricultural sector (see for example Humphrey, 2003; Gibbon, 2003; Humphrey & Memodovic, 2006). Indeed, it is not only the requirements of globalisation and

competitive conditions which necessitate the need for upgrading but also, the world depends on the increase in small farms' productivity to meet global food security and sustainability (OECD, 2012). Similarly, Humphrey (2005) argues that upgrading by smallholders is important because the agro-food chain is associated with rising barriers to entry, and there is a danger of excluding them in business if the appropriate initiatives are not taken. Some of the initiatives according to Humphrey (2005) include: first, smallholders in developing economies should take on new activities in order to increase returns if they have to be involved in the value chain; and second, for the smallholders in developing countries to compete in global markets are required to upgrade their production process in order to gain efficiencies.

As explained earlier on, for smallholders to achieve these, will depend on the type of coordination in the value chain. The type of coordination determines the possibilities of producers to access potential services necessary for improving performance. These services form a basis for capacity building for raising small scale farmers' competencies in meeting standards. World Bank (2011) for instance, reports successful edible groundnuts trade between Europe and Africa in terms of increased quality and yields as result of access to reliable external markets for inputs and outputs, extension services, access to credit and technology. Lack of support to obtain such services would undermine small scale producers' ability to meet standards, without which can lead to small scale producers' exclusion in the value chain. There are cases reporting that lack of capacity to meet standards and leading to the smallholders' exclusion in the business (see for example, Dolan & Humphrey, 2001; Minot & Ngigi 2004; Graffham, Karehu, & MacGregor, 2007; de Battisti *et al.*, 2009).

Therefore, CF is advocated as an institutional arrangement capable of empowering smallholder farmers by integrating them in niche markets through provision of productive resources, e.g. inputs, extension, training, and credit; and incentives e.g. remunerative prices (Prowse, 2012). Such resources are also vital for the most smallholder outgrowers in Tanzania given that they lack capacity to compete with the overwhelming imports coming from cost effective countries due to poor access to resources. The previous studies in Tanzania have not adequately addressed this fact. The

current study bridges the existing gap by exploring whether the opportunities from contract farming arrangements facilitate or obstruct smallholder outgrowers from upgrading their production processes in Kilombero and Turiani. To achieve this objective, the following question was addressed: *What aspects of contract farming arrangements facilitate growers from upgrading their processes?*

In answering this question one needs to open the CF ‘envelope’ using the analysis framework developed by Humphrey (2004); USAID (2006) to access aspects of CF that motivate or demotivate growers from upgrading their processes. The framework categorises aspects for upgrading into two groups: “capabilities” and “incentives” for upgrading. Capabilities for upgrading are the parameters which when implemented facilitate both learning process and acquisition of capabilities for the outgrowers to competitively participate in the production. The incentives for upgrading, on the other hand, are the parameters important for motivating growers to actively participate in the production process. Table 3.1 on page 88, summarises upgrading parameters and their expected influence on the smallholder farmers’ competitiveness in the chain.

3.3 Literature Review

3.3.1 Contract farming arrangements

Contract farming (CF) is defined by Singh (2005) as a system for production and supply of agricultural produce by farmers under advance contract arrangements, such arrangements being a commitment to provide an agricultural commodity of a type, at a specified time, price, quality, and quantity to a known buyer. Similarly, Eaton and Shepherd (2001), Sartorius and Kirsten (2005), Da Silva (2005) view CF as a general term referring to as an arrangement between farmers and processors or marketing firms for the production and supply of agricultural products under forward agreements, normally at predetermined prices. Looking into these definitions, it is revealed that contract forms a kind of governance structure which creates rights and obligations to the producer not only to produce but also supply the produce at right time, right quality, and quantity to the buyer without an apology. In general, both actors are endowed with the

responsibility to undertake execution of the set goals within the established terms of contract.

The way CF arrangement is formulated differs significantly from one product to another. In the sugar sector for instance, contract farming arrangements between outgrowers and processors begin from the contracting process such as drafting, negotiation, signing, litigation and termination (FAO, 2013). The process involves the smallholders and the agribusiness firms agree on a set of duties and conditions. For example, they can agree among others, 1) what to be produced with a focus on product specifications, 2) how is to be produced i.e. production processes including elements of technology to be used, and 3) how much to be produced, this is about physical quantity to be produced, including when and how the flow of product along the chain is to be handled (Humphrey & Schmitz, 2002).

Through the conditions of CF arrangement, a number of opportunities to both buyers and producers can be obtained, depending on the type of arrangement in question. In principle, there are three generic types of contracts, namely: resource provision contracts; production management contracts; and market specification contracts. Resource provision contracts involve provision of certain physical and technical inputs for example, seed, agrochemicals, credit and extension (Oya, 2012). Production management on the other hand, are the contracts in which the lead firm specifies and enforces conditions of production, for example, land preparation, pesticides application, and fertilizer application. Market specification entails contract arrangements covering marketing outlet, timing of sales and pricing mechanisms, and is normally based on quality standards. Contracts that strive to attain foreign market for example, must attain foreign standards which in most cases are set relatively higher than domestic quality standards.

Literature suggests that more stringent standards marginalise smallholder producers because the risks associated with the lack of compliance to the specified standards are borne by the farmer (Prowse, 2012). Other studies have noted smallholders being excluded from CF in favour of large and medium farmers (Kumar, 2006; Singh & Asokan, 2005). Moreover, many contracts have exhibited buyers having excessive

power and impose such power in setting unrealistic specifications (Man & Ndawi, 2010). Sometimes firms have been violating terms of the agreement for example by delaying payment and deliveries to factory or by manipulating provisions of the contract (Singh, 2008). Other studies have reported CF as a tool for protecting company interest at the expenses of farmers, and do not cover farmer's production risk such as crop failure, or crop rejection (Singh, 2005).

Although several literature recognize the shortcomings of CF in influencing farmers' performance, Minten, Randrianarison, and Swinnen (2009) have diverging conclusion regarding the role of CF towards smallholders' performance. Their case study on the production of high value vegetable for exports to supermarkets in French, Belgium, and the Netherlands reveals that high quality control requirements set by the company within contracts for land preparation, compost preparation, extension agent, and pesticides application, were reported to have significantly increased smallholder farmers' income, and productivity by 64% higher on the plots with contract compared to plots without contract. Other benefits to firms include increase in reliability in supply (quantity and quality), transferring risk onto farmers, reduced coordination costs, and flexibility in expanding or reducing production (Prowse, 2012). The benefits of CF to farmers according to Sriboonchitta and Wilboonpoongse (2008); Prowse (2012) include: access to reliable market, and provision of production and marketing services (e.g. seed, fertilizer, loans and tractor services). These services have been regarded as "opportunities" for building capacity of the smallholder farmers to upgrade their production processes.

However, exploitation of CF opportunities for upgrading depends on whether firms decide to adopt contractual arrangement. Because apart from contractual arrangement, there are other alternative procurement strategies which firms may adopt. For instance, firms may decide to procure through spot markets, or adopt vertical coordination of production. Therefore, whether a firm should adopt contract as outsourcing strategy or otherwise, there exists a number of theories explaining firm's decision. The following subsection explains in detail various theories guiding firms' decision to adopt contractual arrangement.

3.3.1.1 Theoretical perspectives of contracting

In an attempt to understand why firms adopt the use of contracts, Young and Hobbs (2002) describe some theories used to explain firms' decision to contract, namely:

- Value chain approaches;
- Transaction cost theory;
- Competency theory;.

Young and Hobbs (2002) categorised these theories into three broad groups: external environment theories; inter-firm environment theories; and internal/managerial environment theories. Such categorisation is based on the specific focus each theory has. For example, external environment theories focus much on political, legal, regulatory, and social economic influences. Such external environment factors may inspire or daunt firms from adopting contracts as outsourcing strategies. Theory falling under this category is value chain approach. The central concerns of the inter-firm theory on the other hand according to Young and Hobbs (2002) include bounded rationality, opportunism, uncertainty, asset specificity, and information asymmetry. Theory under this category is transaction cost theory. The internal/managerial environment theory in which the concerns are knowledge, incentives, profit maximization, information asymmetry, uncertainty, and bounded rationality, is competency theory. Therefore, the current study has adopted these theories, and the detailed synthesis for the convergence and/ or divergence of the theories relative to this study is discussed in the following subsection.

Transaction cost theory

The origin of transaction cost economics, a branch of new institutional economics can be traced far back when transaction cost approaches started as an idea introduced by the institutional economist John R. Commons in 1931. Later the idea was extended, and Coase (1937) made a scholarly contribution through his founding question: "why do firms exist?" Coase responds to his question simply by saying "to minimise transaction cost of exchange". In focusing on transaction cost minimisation, the theory addresses

three important sources of transaction costs when contracting, namely: search and information costs; bargaining costs; and policing and enforcement costs.

Search and information costs originate from the fact that actors participating in business relationships suffer from information deficiencies and they have opportunistic behaviour. That is each actor has an opportunity to cheat and/ or lie for self- interest seeking. Therefore, it is difficult to design an informative contract that documents every aspect including unforeseen contingencies regarding selection of business partners. The theory is concerned with costs related to searching, screening, and finally selecting a producer to be included in the contract. This process may lead to adverse selection problem due to hidden information between the parties involved in the selection process. Key and Runsten (1999) provide examples of costs borne by the firm associated with search and information in contract transactions, i.e. searching for agents and screening for the potential client.

Bargaining costs, on the other hand, are costs required to come upon consensus with each other in the transaction. Under the contract farming perspective, bargaining costs include overheads associated with negotiations of contract, wording and writing a legally binding contract, or safeguarding and monitoring agreement (Key & Runsten 1999; Prowse 2012). Similarly, Key and Rusten (1999) argued that policing and enforcement costs are those costs related to the monitoring behavior of the breach of contract to ensure that other party adheres to the terms of the contract. It may also include the enforcement of contract terms, arbitration costs, legal and auditing costs or product inspection. Therefore, in the lens of transaction cost theory, a farmer may prefer a contract which can be terminated at reasonably short notice (Singh, 2005).

This kind of contract helps to cut short the costs related to enforcement, arbitration and legal procedures. At the same time, a firm's decision on whether should produce an input on its own or should procure via contracts from other sources depends on the costs associated with the coordination of production and motivation of parties engaged in the contractual arrangements (Bogetoft & Olesen, 2004). Other literature have concluded that most firms prefer to work with large and medium farmers (Kumar, 2006; Singh & Asokam, 2005) simply because costs of screening, contracting, supplying, supervising

and paying many smallholders increases transaction costs compared to working with few large farmers (Prowse 2012); or large farmers have pre-established capabilities, hence costs related to extension, training, and input provision that could have been granted to smallholders are avoided (Singh, 2008).

Henceforth, business relationships through contracts will sustain only if costs of economic exchange are kept at their lowest possible levels compared to other procurement sources. But this theory does not work for the contracts involving crops that command high quality and values per unit such as fruits and vegetables, organic products, spices, flowers, tea, tobacco, and dairy products (Minot, 2007).

Competency/ capability theory

While transaction cost theory emphasises on the minimisation of costs of economic exchange for the business to sustain, competency/ capability approach on the other hand, emphasises on mutual competencies among actors in the contractual relationships (Prowse, 2012). It is assumed that it is almost impossible to have a sustained relationship if the actors have unequal capability. Young and Hobbs argue that the internal management of CF arrangements requires individual or team competencies, skills, and tacit knowledge that help to maintain the organisation of the arrangement (Young & Hobbs, 2002). Prowse (2012: 35), on the other hand asserts “the ability to create and sustain contract farming operations relies to large extent on the skills and experience of staff and the ability of the organisation to maximise these”.

Capability, according to this theory means knowledge, skills, information, or resources owned individually or by groups which need to be shared and spilled over within the organisation. This implies that each actor in the arrangement should have the capability to perform the assigned tasks, for example farmers should have capability to produce according to the specification. Capability also can be considered as the ability of individuals to learn and apply the knowledge and skills acquired to undertake a particular activity. According to this theory organisation that fails to facilitate sharing, learning, and synthesis of endowed capabilities because of any reasons, business relationships could hardly exist and a door for upgrading would be closed.

Value chain approach

Value chain approach has been recognised as configuration that enables obtaining the full set of capabilities needed by developing country firms in order to compete in the global economy, such that global buyers would encourage developing country firms to experience fast learning and upgrading (Navas-Aleman, 2011). Thus, in explaining contract farming arrangement using value chain approaches, the insight of Williamson (1979) can be applied, which proposes three different forms of coordination, namely markets; networks; and hierarchies. These forms of coordination are defined by the complexity of the information that needs to be transferred, the extent to which this information can easily be communicated, and the supplier competence (Prowse, 2012; Gereffi, Humphrey, & Sturgeon, 2005). Market type of coordination, for example is characterized by low buyer concentration and low producer concentration. That is there is no buyer (market) dependency, no one in the relationships can influence upgrading of the other because buyer is not involved in a product definition (Navas-Aleman, 2011).

Network coordination according to Williamson (1979) can further be re-categorised into three forms, namely relational linkages, captive linkages, and modular linkages. In relational linkages coordination of activities between firms exists with mutual interdependence. In this case players must possess complementary capabilities.

Captive linkage is characterised by high buyer dependency, and producer is subordinate to buyer. Buyer sets production parameters for the producer to adhere. The linkage is also characterised by high information asymmetry (buyer knows more about producer costs and capabilities than producer knows) (Navas-Aleman, 2011). In this kind of coordination, buyer has the mandate to upgrade/ downgrade the subordinate.

As explained earlier on, standards matter a lot in deciding which forms of coordination should be adopted. For instance, if communication of information about product quality and attributes needs in-depth and repeated interaction between buyer and supplier, networks or hierarchies can suffice (Prowse, 2012). The type of coordination adopted by the firm will determine the degree of producers' involvement in the business. For example, hierarchies are adopted when the product is associated with high quality

specifications and when producers' competence is relatively too low to meet such specifications. This implies that the buyer will vertically coordinate the production chain by forming one administrative body, where a buyer covers and controls numerous nodes in the supply chain. In this case, producers have little or no control over production processes, and hence, upgrading would be undermined. Therefore, according to Navas, values chain approaches do not guarantee an automatic upgrading pathway nor does not provide access to the whole range of activities needed for developing producer to compete in global economy (Navas-Aleman, 2011).

3.3.1.2 Synthesis of theoretical approaches to contract farming

The transaction cost approach sets some of the internal framework in which contract farming takes place. One notable issue in the theory is its emphasis on the existence of an organisation based on the transaction costs related to its operations. It means that the decision of the firm, for example, to choose resource provision contract is limited by the costs involved when compared to other alternative options available such as in-house production or using spot markets. Alternatively, firms may prefer to contract with few large farmers instead of contracting with many smallholder farmers due to costs involved in handling them. Based on this theory, smallholder farmers in developing countries are likely to be excluded from contracts, because of the costs involved in supporting them.

Competency/ capability theory on the other hand, emphasises mutual capabilities among the parties involved in the CF arrangements. It maintains that each part in the arrangement should have the capability to contribute towards achievement of the organisation. This means that for CF arrangement to succeed, parties involved should have complementary competencies which will increase productivity and profitability. However, mutual capabilities work well only if management of the arrangement is able to elicit and utilise these competencies in an efficient manner (Prowse, 2012), otherwise such organisation will not sustain. From this theory, the message one gets is that firms will prefer working with large farmers because of their feasible capabilities in terms of both financial and physical resources compared to developing country smallholder farmers who are highly constrained by such resources.

In the value chain perspective, the type of coordination in an organisation determines upgrading opportunities for producers. The coordination type focuses particularly on the increasing role of standards relative to suppliers' competence in the value chains. In other words of similar meaning, involvement of smallholder farmers in the value chain will depend on their competence and product requirements. High product requirements in terms of quality specifications coupled with relatively low suppliers' competence, hierarchy linkages are likely to take charge and small holders are likely to be excluded.

In general, all theories (transaction cost, capability, and value chain) alert that partnership between two parties prevails based on the transaction costs involved and individual or group competencies possessed. The partner without competence is likely to be excluded. Therefore, when discussing the role contract farming arrangements in enhancing upgrading of smallholder farmers, the three broad theories should be taken onboard.

These theories are relevant for the current study due to the fact that agronomical, sugarcane crop requires tremendous investment in human and no-human capital goods. At the same time smallholder sugarcane farmers in Kilombero and Turiani, just like other smallholder farmers in SSA have poor agricultural income base and they are constrained by many aspects including lack of knowledge and skills related to crop management; have limited capacity to obtain inputs; and cannot afford investment expenditure necessary for efficient production (Poulton, Dorward, & Kydd, 2005; M4P, 2005). Thus, smallholders cannot stand alone competitively without support from contract farming arrangements or other stakeholders like NGOs, public and private institutions. Though it is costly, it is inevitable to support smallholders raise their capabilities by offering training, extension services, providing them with inputs, credit, and market information if the aim is to involve them in the high-value markets. Otherwise the form of coordination that arises would either exclude or retain them in the business.

Therefore, based on the theories presented above, when adoption of CF is considered by the firm as the best strategy among other procurement strategies available, it implies that the firm meets minimum costs associated with offering a CF package to smallholders.

Theoretically, smallholder farmers involved in the CF would expect their capabilities been enhanced, and motivation to participate actively in the CF arrangements induced. Capability enhancement and incentive provision have been demarcated by Gibbon (2003) as means and rewards for upgrading respectively, available to producers who are engaged in CF arrangement. Enhancing smallholders' capability for the current study entails availing farmers with learning process and acquisition of capability. On the other hand, the incentive for upgrading is a kind of smallholder farmers' motivation to participate in the highly-remunerative markets. The subsection below discloses the upgrading concept as used in the global value approach.

3.3.2 Upgrading

Upgrading is a concept which can be used in many contexts, depending on how it is conceptualised and applied for a given setting and convenience. Many practitioners of the global value chain work concur with Gereffi (1999); Humphrey and Schmitz (2002) opine that upgrading could be conceptualised through two main approaches, clusters and value chain. Literature in the clusters approach hypothesises that upgrading is firm's competitiveness resulting from local innovation facilitated by interactions of firms within the cluster (Humphrey & Schmitz, 2002). Similarly, Scott (1996) sees upgrading in clusters' viewpoint as a consequence of interaction which strengthens the role of local factors in competitive advantage. Other studies such as Cooke and Morgan (1998) acknowledge that the likelihood of strengthening global competitiveness is through interaction of firm with local or regional industrial policy. From these descriptions, it is noted that the cluster literature views upgrading as a competitiveness resulting from interaction between local firms or with institutions. The main focus is on the integration of local producers with the local institutions within the country or region. In other words, for the industry or firm to speed up innovation and expand into new markets and compete accordingly, it requires support from local and/ or regional institutions.

Upgrading in the value chain perspective, unlike clusters approach assumes that it is made possible through learning by doing and through the allocation of new tasks by chain's lead firm (Humphrey & Schmitz, 2002). Indeed, the value chain approach assumes that upgrading is enhanced by the interaction between local producers and

global buyers with the focus on ‘promoting capability’ of local producers for an assurance of business sustainability, profitability, and stability (Humphrey & Schmitz, 2002). While clusters approach assumes upgrading as a result of interaction between firms and local institutions (horizontal interaction), value chain approach assumes that upgrading is a result of the interaction between lead buyers and local producers (vertical interaction) which consequently builds capacities of the local producers.

Based on these two main approaches, the United States Agency for International Development (USAID), defined upgrading as a ‘means for acquiring the technological, institutional and market capabilities that allow resource poor rural communities to improve their competitiveness and move into higher value activities’ (USAID, 2006: 2). On the other hand, Humphrey and Schmitz defined upgrading as making products more efficiently and increasing value adding activities by making more sophisticated products and taking on more sophisticated processes (Humphrey & Schmitz, 2004). Both definitions share common focus, they emphasise on improving actors’ capabilities and efficiency in the chain.

Upgrading is further categorized into various forms. These traditional forms of upgrading were introduced by Gereffi (1999); Humphrey and Schmitz (2002); Kaplinsky and Morris (2008) and they include process upgrading, product upgrading, functional upgrading, and inter-sectoral upgrading. Although these forms of upgrading were initially developed to suit the manufacturing sector, yet with development these forms of upgrading have now modified to apply in the agricultural sector (Mitchell, Kaene, & Coles, 2009).

Process upgrading, is the way inputs are transformed into outputs more efficiently by taking into consideration the production systems or introducing superior technology (Humphrey & Schmitz, 2002). This definition focuses more on technological upgrading, which typically applies in the manufacturing industry (Mitchell et al., 2009). Further definitions have been developed which focus more on the upgrading strategies relevant to the agricultural sector. Thus, process upgrading in the agricultural context entails “improving chain efficiency by increasing output volumes or reducing cost for a unit of output. For instance, improving agronomy to enhance yields which may involve the use

of improved technologies, planting materials, or supply of inputs” (Mitchel et al., 2009: 33); or by introducing irrigation infrastructure (von Braun & Webb, 1989).

Product upgrading is defined by Humphrey and Schmitz (2002) as moving into more sophisticated product lines. In agricultural context, product upgrading means improvement in product quality, or shift to another product category (Mitchel *et al.*, 2009). It may also imply for example, moving from inorganic to organic crop production (Elyhorn, Mader, & Ramakrishnan, 2005). Generally, product upgrading in agriculture is closely related to process upgrading because improving product quality normally involves improvements in the production process.

Functional upgrading involves ‘acquiring new functions or abandoning existing function to increase the overall skill content of activities’ (Humphrey & Schmitz, 2002: 1020). In agricultural context, functional upgrading occurs when farmer adds value by processing the product (Bolwig *et al.*, 2009) or by removing intermediaries in the chain (Singh, 2008).

Inter-sectoral upgrading: Inter-sectoral upgrading involves moving into new productive activities e.g. moving from producing TVs to monitors and other computer accessories (Humphrey & Schmitz, 2002).

3.3.3 Contract farming and Upgrading

Humphrey (2004) documents two broad parameters for upgrading, namely; capability and incentives for upgrading. These parameters for upgrading could be availed to farmers who participate in CF arrangements.

3.3.3.1 Capability for upgrading

Capability for upgrading according to Humphrey (2004) is further categorized into two themes, namely; learning process and acquisition of capability.

Learning process

Upgrading literature acknowledges that learning opportunities in the domestic markets and foreign markets can be greater for certain types of skills needed by developing country firms to compete in the global economy. Learning process has been viewed into two thoughts 1) learning by doing and 2) learning first and do an activity later. These thoughts evolved from the traditional learning by exporting paradigm, which emphasized the superiority of exporting for learning and industrial upgrading. Later on, Greenway and Kneller (2007) criticised this notion through econometric studies which revealed that improvements in product and process performance of exporting firms are the result of sunk-cost investments pre-dating their export activity, not of learning by exporting. This means that learning by doing has little impact on upgrading instead prior knowledge before doing an activity has large impact on upgrading. Thus, the current study conceptualises learning process as a result of sunk-cost from the provision of: training, extension services, agri-inputs, and credit to farmers. The discussion following below is centered to the key parameters for learning process according to Humhrey (2004), which include training, extension services, access to information and adoption of the best farming practices availed to farmers before they are involved in the production process.

Availability of training: Training is important because it is the only major way of building human capital. Training impacts knowledge, skills, and understanding necessary for making viable decisions. However, World Bank (2011) warns about the appropriate type of training required to avail to farmers. It argues that training should release technical knowledge in farm business and marketing, practical skills in applying farm management concepts and tools, and skills or knowledge that empowers farmers to recognize and make changes for their benefits (FAO, 2013). Such training program impacts skills and knowledge which capitalize farmers to adopt improved farming practices, and becomes a vehicle to competitiveness resulting into high yields (USAID, 2006; Bolwig *et al.*, 2009). Resource provision and production management contracts may relax this requirement. Apart from the provision of credit, inputs, production and

marketing services, resource and production contracts provide training and extension services (Prowse, 2012).

Literature provides evidences across crops showing how smallholder farmers' capability towards upgrading processes has been enhanced through training. For example, Cocoa production in Indonesia (USAID, 2006); organic cocoa in Latin America (Humphrey, 2004); milk producers in Zambia (Emongor, Louw, Kirsten, & Madevu, 2004); organic coffee in Uganda (Bolwig *et al.*, 2009); horticulture production in India (Mitchell *et al.*, 2009); and sugar production in Kenya (Grosh, 1994). The most sited areas where the training concentrated in most cases were in the agronomic practices such as proper farming methods including understanding of varieties of fertilizers (organic or conversional) for specific crops e.g. organic fertilizer to organic crop; and farm management including plan of activities like farming calendar, profit and loss accounts or more generally financial management which helps to improve decision making of the farmer in the use of resources (Mitchel *et al.*, 2008; Bolwig *et al.*, 2009; FAO, 2013).

Availability of extension services: The role of extension services in enhancing learning process and ultimately a means for process upgrading has been considered as critical and increasingly in demand towards the current era of market-led farming. The objective of extension as FAO puts it, is 'to build human capital by increasing the technical and managerial skills of farmers and expand their capacity to learn' (FAO, 2013: 86). Not only extension enhances learning but also necessitates farmers to know how to evaluate new options and where to obtain the information needed to make better production decisions. Nevertheless, the exact levels of extension services required vary depending on the crop and how it is new to farmers (Bolwig *et al.*, 2009). But the reported ratios by Gosh (1994) are typically in the range of 1:50 to 1:200 of highly trained specialised and competent extension staff vs. farmers.

The extension staff to farmer ratio reflects the number of visits each extension offer could make to farmers. Therefore, ratios outside this range would be considered ineffective since the larger the ratio the fewer the number of visits the staff would afford to make. Extension officers in visiting give technical advice, do farm inspections and monitor the performance of each farmer in terms of compliance to the standards and

other product requirements which are crucial for competitiveness of the farmer (Bolwig *et al.*, 2009). Thus, if a farmer receives partial visits or no visits at all, lacks the opportunity to learn and becomes difficult for him to compete. Contract farming through the company's qualified technocrats would provide better services to farmers. Minten *et al.* (2009) reported a ratio of 1:30 in French bean contract farming in Madagascar. These extension services could be on the use of pesticides, fertilizer, and on-farm inspection. Extension services would also involve guiding farmers about the sowing and harvesting operations.

Literature reveals that extension service is an impetus towards smallholder upgrading. According to Setboonsarng *et al.* (2008), smallholders who lack extension services are more likely to be excluded from the growing markets of high value crops. Meanwhile, smallholder vegetable farmers in Bangladesh who participated in the GKT programme their income increased two folds and they were able to move from vegetables to fishing cultivation after they have received training and extension services from NGOs and GKT extension officers, implying a further upgrading from process to inter-sectoral upgrading Naved (2000). Tomato producers in Zambia on the other hand, were able to meet grades and standards set by supermarkets because of technical assistance and extension services received from NGOs (Emongor *et al.*, 2004). Whereas, spillovers of the skills learned from French bean contract farming led to a significant success in rice production by Madagascan farmers (Minten *et al.*, 2009).

Best farming practice: Best practice is anchored under a question like what needs to be done, and what is done. But many contracts require farmers to follow farming practices prescribed by the scheme. More generally, best farming practices include adherence on the planting and harvesting dates, weeding and fertilizer application practices, and other standards as specified in arrangement. Emongor *et al.* (2004) argue that timing in both planting with correct plant density and weeding promotes more yields per acre. Thus, various practices specified affect yields, quality and other characteristics that alter the crops' value to processors (Grosh, 1994).

Adhering consistently to the best practices provides knowledge base that can be used for improving productivity (USAID, 2006). Unfortunately, most husbandry specifications

are associated with complex price schedules in such a way that practices specified are not reflected in price differentials to farmers (Grosh, 1994), which may impede economic rationality. This is because farmers are aware of the opportunity cost of labour and inputs in such a way that those practices affecting the quantity and timing of labour should bear the corresponding returns. If the effect of such practices is reflected in farmers' returns, they can balance the costs and benefits and use those techniques that equate marginal cost with marginal benefit, otherwise there is no reason to believe that economic rationality will be achieved if the effect of such practices is not reflected in farmers' returns (Grosh, 1994).

Acquisition of capability

Despite the human resource capacity building which might be enhanced through learning processes, yet smallholders are constrained by other factors such as capital and financial resources which could undermine technological adoption. So, in order to raise the level of smallholders' competence as suppliers in relation to requirements placed upon them, there is no alternative option other than addressing those factors constraining them. This is typically relevant for smallholder farmers in Africa, Sub-Saharan Africa in particular where farm-level resources are generally erratic. As IFPRI (2012: 15) put it "strategies for transforming Sub-Saharan Africa agriculture have to address such challenges as low investment and productivity, low funding for agricultural research, inadequate use of yield-enhancing technology, unfavorable policy and regulatory environment" in addition to human resource development.

On the other hand, Barret *et al.* (2012) argue that limited credit access and other institutional constraints hinder production capability of smallholder farmers in developing countries. With regard to these premises, literature such as Humphrey (2004); Mitchel, Keane, and Coles (2009) suggest parameters that could be used as indicators for smallholder farmers' acquisition of capabilities. These parameters include agro input provision scheme, access to credit schemes, expenditure on investment, and public/ private R&D. This paper studies smallholder farmers' acquisition of capability based on these parameters.

Provision of input: While the importance of small farmer input credit provision under government support in promoting the uptake of improved farm technology is well recognized, the role of governments in developing countries has been that of creating conducive environment for the private sector to take the lead in marketing and distribution of agricultural inputs. Unfortunately, the private sector unlike public sector, has profit motives behind any business transaction. Such motives have accelerated barriers to the adoption of productivity-enhancing inputs in African agricultural systems (Jayne *et al.*, 2010). Literature acknowledges that private-marketing and distribution of various agricultural inputs such as fertilizer, improved seeds, agro-chemicals and tractors is associated with higher prices against low output prices (URT, 2008). Jayne *et al.* (2010) argue that high prices of modern inputs is due to high costs of delivering them to small-holders and they constrain profitability and effective demand, and smallholder farmers' ability to finance them. Subsequently, such costs become barriers to productivity-enhancing input adoption.

The root cause according to URT (2008) is the fact that smallholder farmers in developing countries, Tanzania in particular do not have readily acceptable collateral to secure loans from formal financial institutions, which could have helped to solve problem of financial constraints. With regard to this scenario, contract farming option provides input inexpensively and in a kind of short term loan. M4P (2005) noted paddy farmers in Vietnam claiming that purchasing all the input during the growing season was very expensive, but they consider input provision through CF as a key incentive for the use of contracts. Experience from Uganda shows that public/private partnership in assisting sorghum small-scale producers with input has proved to have significant impact on sorghum production, farmers upgrading, and the total value added by the sector (World Bank, 2011). Similarly, India adopted the public/private partnership model and proved to be very successful (World Bank, 2011). Generally, provision of services such as agro-input through CF helps to solve capital/ resource constraint, and it is a key parameter for enhancing non-human resource capabilities. Hence, it was presumed that provision of inputs to farmers on time and consistently through contract farming arrangement has significant impact on farmers' process upgrading.

Access to credit: Credit accessibility in agricultural production is vital because it is a basis for obtaining agro-inputs such as improved seeds, fertilizers, chemicals and machinery which are basis for productivity. Without credit support and subsidy programme could be difficult for marginal farmers to obtain such inputs because they are very expensive relative to small farmers' income. Otherwise marginal farmers could decide to engage themselves in borrowing from informal credit providers who usually charge very high interest rates (Dawes, Murota, Jera, Masara, & Sola, 2009). Access to formal credit is often very difficult and sometimes costly for small farmers because they lack collateral. Sometimes when collateral does not restrict access to formal credit, transaction cost associated with acquiring bank loans is high, does not permit farmers to borrow credit from banks (Swain, 2008). CF literature acknowledges that credit constraint can be relaxed by the use of resource provision contracts for direct credit provision or CF as collateral for credit (Prowse, 2012). If small farmers are assured of credit provision, the risks and uncertainties of accessing potential agricultural inputs are completely eliminated.

Investment: The role of investment expenditure in improving agricultural sector is obvious. Agricultural occupation in SSA for example takes place in rural areas where infrastructure is predominantly poor. Farming activities in this region is characterized by rain-fed agriculture, occupied by smallholders with less land holdings and financial constrain. Therefore, investment focusing to boost smallholders' agricultural production and productivity should emphasis among others on irrigation facilities, roads from farm-to-market, farm implements, and seed improvements. Such investment increases the possibility for upgrading production processes to smallholder farmers. Indeed, investing in such upgrading opportunities is important and can have significant impact on farmers' revenue, trade competitiveness, and the total value added by the whole chain (World Bank, 2011). Unfortunately, these upgrading opportunities do require major investment that may be beyond the smallholder farmers' capabilities (UNIDO 2011). Hence, support from other agricultural stakeholders such as NGOs, state institutions, buyers via CF arrangements, farmers' associations, and cooperatives are inevitable.

There are some practical examples of smallholder farmers who upgraded their production processes due to investment expenditure from various sources. Organic cocoa smallholder farmers in Latin America for example, improved their production after acquiring knowledge through investment done to the cooperatives by the buyers who were looking for new sources of organic cocoa. The rapid expansion of cocoa production was influenced by the application of new technology which provided conduits for the transfer of knowledge that couldn't easily be acquired through other ways (Humphrey, 2004). The role of investment in accelerating incentives to increase production and productivity was realised in Asia and Latin American as well when governments decided to commit significant investment in agricultural technologies and rural infrastructures, as result small farmers upgraded their production processes and Green Revolution was experienced (Thapa, 2010).

On the other hand, introduction of irrigation facilities in rice farming in Gambia facilitated women farmers to gain competitiveness in rice production, the crop which was formally a man-controlled crop (von Braun & Webb, 1989). It was noted by von Braun and Webb that such technological change affects the distribution of resources at the inter-household level signalling the importance of incentives in changing farming systems, which consequently resulted into process upgrading and high yields (von Braun & Webb, 1989). Sunflower in Uganda increased dramatically from 400 kg/ha to over 800 kg/ha after adoption of improved seed variety produced under Vegetable Oil Development Project (VODP) investment support in the sector (World Bank, 2011). Thailand is now the world's second largest producer of Black Tiger shrimp after multinational firms like Cargill were encouraged to invest in smallholders and returns to smallholders were substantial.

3.3.3.2 Incentives for upgrading

Smallholder farmers might probably have acquired all the necessary capabilities for upgrading as discussed in section 3.3.1, but if no incentive for them to participate in the particular business nothing can be realised. Therefore, the incentive for upgrading is equally important and complements the capabilities for upgrading. Humphrey (2006); USAID (2006) suggest the following parameters to act as incentive indicators for

upgrading, namely: price of output or market access; availability of supply; infrastructure and logistics; payment mechanisms and institutional issues.

Price of output, or more generally market access has been one among the most important factors influencing the performance of the small scale producers in developing countries, and least developed countries in particular (World Bank, 2011). Unfortunately, smallholder farmers' participation in higher-value markets according to World Bank (2011) is constrained by the tightened, broadened, and proliferated quality, food safety and other standards. At the same time smallholder farmers are suffering from inadequacy farm-level resources, farm-to-market logistical blockages and transaction costs related to input procurement logistics. It is assumed that when the small scale farmers' capacity building initiatives is successful, then access to high-value markets would increase incentives for high production and productivity. CF arrangements provide access to market in a number of ways, including through price determination based on fixed grades, fixed price mechanisms, or using a cost based formula (Prowse, 2012). A cost based formula for price determination increases farmers incentive to actively participate in the business because this ensures that farmers are insulated from price drop.

There are many cases where remunerative price of output have shown positive effect on productivity and upgrading of smallholder farmers worldwide. Coffee farmers in Uganda for example, upgraded their processes and net income increased after introduction of contract farming arrangements which among others stipulated an assurance of price premium which reduces farmers' uncertainty about the net returns from processing coffee crop (Bolwig *et al.*, 2009). Similarly, a comparison study on conventional and organic cotton production in India reveals that organic farmers were more competitive in their production process than conventional farmers due to price premium they received through contract from a private company called Maikaal bioRe (Eyhorn *et al.*, 2005).

The influence of better prices towards competitiveness of the smallholders was also observed among smallholder fishers in Lake Victoria in Tanzania. Fishers in Lake Victoria whose fishing targets local market faced prices which were escalating below

marginal cost and remained less competitive, while those fishers whose fishing targets international market through the Nile Perch, proved to have better performance because of better prices and were able to meet the standards set by EU food safety (Kadigi, Mdoe, Senkondo, and Mpenda, 2007). Generally, remunerative price acts as a catalyst for the farmers to produce more, as Nkonya and Barreiro-Hurle put it ‘when marketing condition is reliable, producers respond to incentives with reliable production’ (Nkonya & Barreiro-Hurle, 2012:8). Sometimes CF arrangements may offer prices which can or cannot compete with the benefits and services provided by selling to the open market, thus, may create incentive or disincentive to farmers to participate actively in the business.

The pre-agreed price arrangements may create monopolistic kind of markets in which competition is discouraged. The competitive market as perceived from elementary microeconomics is characterised by price rising spawned by excess demand over supply. Consistent increase in price may happen when there are many buyers relative to suppliers resulting in an increase in demand and eventually price. Production of cocoa bean in Latin America provides an illustrative example on how consistently price rose up due to the presence of multiple local and international buyers who were competing on cocoa bean prices, and farmers were motivated to commit their resources fully in cocoa fields (Humphrey, 2006). Contrary to this, CF arrangements may create monopoly and discourage competition, which may consequently lead to lower and disincentive prices.

Availability of supply is one important indicator for measuring productivity of agriculture at global level. Yields and especially average yields which convey the gross productivity of land is used to evaluate other factors like production technologies used such as supply of input applied, or supply of water. Availability of supply has been a source of competitiveness for China in international groundnuts market due to its ability to produce quantities consistently and at competitive prices (World Bank, 2011).

Thus, provisions of CF regarding pre-agreed quantities may create incentive/disincentive to farmers depending on whether the pre-agreed quantities allow consistent supply. In crops like sugarcane, availability of supply is largely depends on a number of

factors including mills capacity, season length, and daily ratable delivery (DRD) allocation.

Mills capacity is connected to the absorptive capability of the mill in handling growers' sugarcane yields. Capacity of the mill induces the possibility of the increase or decrease in supply. When the mill's capacity is low, only few outputs delivered for crushing would be accommodated, and this would discourage next harvests. Similarly, the length of the season matters in motivating supply. Season length depends on weather conditions of each calendar year. For production associated with poor road infrastructure from farm gate-to-mills, such infrastructure prohibits delivery of yields especially during wet season and persistence of this problem reduces farmers' morale from increasing production.

DRD allocation to farmers on the other hand, is a limiting factor towards increased supply if it is unfavorably determined. Low DRD allocation discourages expansion of production during the next season. In South Africa for instance, cane supply is managed by the mill group board (MGB), which does the allocation of DRD base on the crop estimate submitted by the growers (LeGal *et al.*, 2005. According to this author, calculation of DRD takes into account the total cane production for the mill area, the mill capacity and the planned annual length of milling season. In situations where miller is also the supplier of the product, DRD allocation to growers can be affected greatly depending on the productivity and yields from the mill's estates. Hence, the DRD trend allocated to smallholder farmers by the processor increases or decreases incentive to farmers to produce more sugarcane to meet the DRD requirement.

Infrastructure and logistics: Investment in physical infrastructure and logistics is crucial for agricultural development. Crop like sugarcane needs infrastructure and logistical services such as access roads, drains and fire breaks. Such services would help transport cane, removal of excess water, and prevention of unplanned fire, respectively. Transport costs are generally the largest single component of price differences between surplus and deficit (Fafchamps & Gabre-Madhin, 2006; Jayne et al., 2010). Thus, in order for the smallholder farmers' improve their production should have access to such services.

Payment mechanisms: The term payment mechanisms are used in this study to mean payment systems, which include modalities and timing of payment. Payment mechanism has been recognised as a major incentive for upgrading, although mechanisms of payment differ from one product to another and depends on the arrangement in operation. In the sugar sector payment mechanism is associated with many varying payment systems across countries. The generic payment systems established is based on three main components, namely, payment aimed at sharing the value between millers and growers; payment based on quality of the cane; and payment based on tonnage delivered (Le Gal, Papaiconomou, Lyne, & Mayele, 2005; Lejars *et al.*, 2008).

Payment based on revenue sharing is an agreement between millers and growers on splitting net revenue accrued from sugar and molasses using a fixed percentage, e.g. k% for smallholders and 100-k% for miller. In South Africa for example, the 2004 agreement between growers and millers on net division of proceeds sets at approximately 36% to millers and 64% to growers and it is negotiable at every 10 years (Legal *et al.*, 2005). In Tanzania, the net revenue sharing agreement was set at 53.5% to growers and 46.5% to miller in Mtibwa according to 2009/2010 season and negotiable at every 2 years. While in Kilombero net division of proceeds for 2013 was set at 55.5% for growers and 44.5% for miller and was negotiable at every crushing season.

Payment system based on cane quality on the other hand, is designed to encourage smallholders to deliver quality cane, create incentives to improve cane yield, and milling performance (Le Gal *et al.*, 2005; Lejars *et al.*, 2008). Cane quality is a crucial parameter as it impacts on sugar production and stakeholder profitability. According to Le Gal *et al.* (2005) sugarcane with high fibre and non-sucrose content is more difficult to extract sucrose from it leading to mills inefficiency and consequently low rendement to producers. Following this, Murray (2002) and Moor (2002) developed a formula explaining how cane quality is measured. It is expressed as a Recoverable Value (RV) derived from the Estimated Recoverable Crystal (ERC), which includes Sucrose (S), Non-sucrose (NS) and Fibre (F) contents of cane as follows:

$$\%RV = \%S - d.\%NS - c.\%F$$

Where: c represents sucrose trapped by fibre and lost during the milling process; and d represents both sucrose trapped by non-sucrose and the molasses revenue earned from non-sucrose.

The third component of the payment system is payment based on tonnage delivered to the mill. It is a relative payment system designed to discourage growers from over delivering when their cane quality is high (Le Gal *et al.*, 2005). As augmented from Le Gal *et al* (2005:4) estimation of the relative RV is given as follows:

$$\%RV_{ij \text{ relative}} = \%RV_{ij \text{ measured}} - \%RV_{j \text{ mill area average}} + \%RV_{\text{season mill area average}}$$

From this expression, the growers deliveries is compared with the overall mill area average on weekly basis, whereby, subscript i and j represents grower i and week j respectively.

Generally, payment system according to Higgins and Muchow (2003); Kroes and Fadden (2004); Lejars *et al.* (2005); Le Gal *et al.* (2008) can be the key to increasing industry profitability. But, if at the same time payment system is not modified to suit all stakeholders can impede such improvement. For instance, payment systems aiming at promoting the production of sugar extraction, thus encouraging high sucrose content would penalize fibre rate, despite the fact that the fibre can be used to produce by-products that have high value than sugar (Lejars *et al.*, 2008).

Timing in payment is also equally important in promoting competitiveness of smallholder farmers. Payment system by itself as a formula might have been designed very well to suit almost all stakeholders' interests, but if the implementation is not effected on time can equally harm the welfare of the stakeholders. It is the money received from producers' yields that needs to be used for further field development, input purchase, and other domestic expenditures without being affected by any delay.

Although payment mechanism has been recognized as major incentive for upgrading, yet it has been associated with some challenges, including the willingness of buyers to offer remunerative and timely payments to producers. For instance, payment based on revenue sharing or division of proceeds as frequently called, has been claimed for

lacking transparency and rationality, and dominated by mistrust and conflicts between buyers and producers (Lejars *et al.*, 2010). Likewise, division of proceeds calculation is a hypothetical formula representing industry income but it does not reflect actual revenue of the industry (Yamba, Brown, Johnson, Jolly, & Woods, 2008). Indeed, payment based on quality is often based on complex sophisticated formulae for quality determination, such that it is difficult for producers and other stakeholders to understand (Lejars *et al.*, 2010).

At the same time, timing in payment has been challenged for being effected late, causing problems in other economic activities which depend on cash flow from the sales of contracted crop. Such scenarios pose some challenges to the generally accepted idea of the influence of CF in enhancing smallholders upgrading possibilities.

Institutional issues

The role of institutions in society is to reduce uncertainty by establishing a stable structure to human interaction. In a similar vein, the value chain in the sugar industry globally is regulated by a number of regulatory frameworks, such as national rules, regulations and policies, regional and international standards, and bilateral agreements such as export quotas. These regulatory frameworks are designed to control or govern the sugar sector. At country level, Tanzania in particular sugarcane production is governed by Sugar Act. According to URT (2001), the law governing the sugar sector Part II Article 3 (1) of Sugar Industry Act 2001 for example, establishes the Sugar Board of Tanzania (SBT) which has given the mandate to control sugarcane quality, and registration of outgrowers who supply cane to the respective sugar mill. This implies that no person shall grow and supply sugarcane to the mill unless is registered by the Board.

The regulations derived from this Act have provisions directing outgrowers to comply with good agricultural and management practices, comply with the sugarcane variety approved by the mill, and comply with the growing and delivering schedules. The regulations also direct the Board to enter the cane field of any sugarcane grower to inspect and verify the compliance to these regulations by the grower. In general, these

laws and regulations intend to ensure that the outgrower produces the sugarcane of acceptable standards.

Regional, international and bilateral arrangements on the other hand, have influence on the economic activities of the individual countries. For instance, the introduction of the new 2006-2015 National Strategy on how sugar industry should raise efficiency and reduce production costs is an example of the effect of external forces from the WHO ruling regarding the EU's sugar regime package to Tanzania (SBT, 2011). The guides provided in the national strategy dictate how farmers gain their livelihoods, and how their production system and trade in the value chain are structured.

Thus, these institutional frameworks have influence on the effectiveness of the contractual arrangement operating under them. Banerjee *et al.* (2003) raised concerns regarding existence of proper legal institutions that can be effective and impartial arbiters of contract disputes between buyers and producers in developing countries, given that the buyers are so powerful compared to producers and their governments. Therefore, ineffective legal and regulatory frameworks can affect adversely performance of the CF arrangements and subsequently to the producers upgrading possibilities.

3.4 The analysis framework

Based on the body of literature presented in this chapter, it can be drawn that process upgrading is essentially a function of producers competence and commitment in their production processes, as illustrated in Figure 3.1. The degree of competence depends on the means the smallholder farmers are enabled to achieve such competence. Competence can be achieved by learning through training, availability of extension services, and adoption of best farming practices. Availability of training and extension services measures the extent to which knowledge flows within the value chain particularly from larger buyers to small suppliers (Humphrey, 2006). Navas-Aleman (2010) uses similar indicators when assessing process upgrading of firms operating in multiple value chains, using Brazilian Furniture and Footwear Industries. Among the questions asked in the Navas-Aleman study were: (1) whether workers received any training or had any qualification. In order to capture this, the current study asks whether farmers were

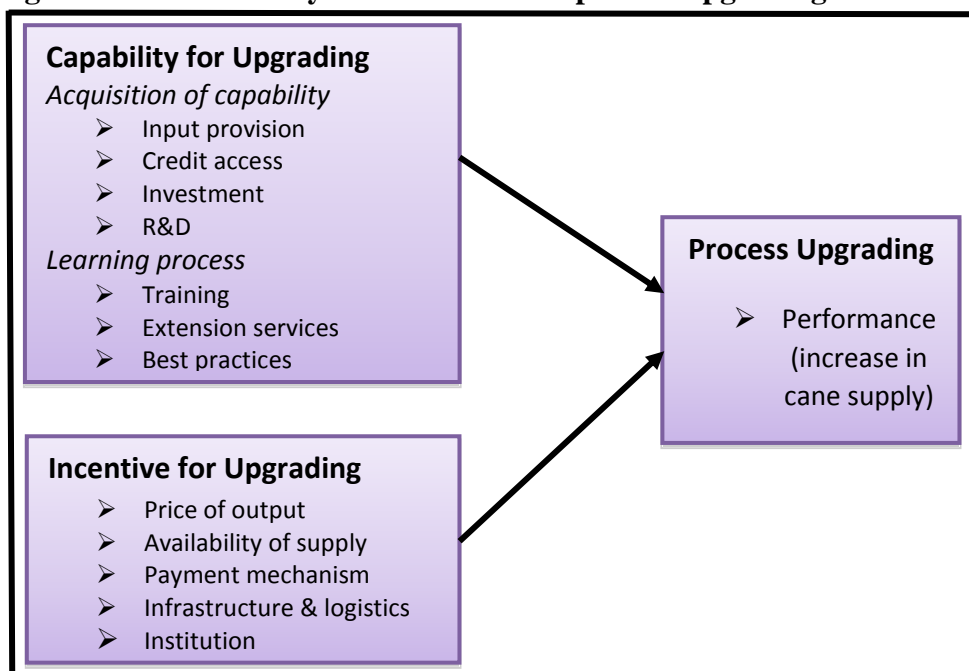
availed with training and extension services. (2) Whether there was improvement in the production process. This study assessed improvement in production process by using availability of supply as an indicator. Similar indicator was also used by (USAID, 2006). (3) Usage of technology in the production process. The current study uses input and credit provision to farmers as indicators of the usage of agricultural technology in production process. (4) Investment in physical capital such as machinery. The current study assessed whether investment was done in infrastructure such as irrigation facilities and roads from farm gate to milling station. In general, training, input provision, access to credit, making investment and doing researches are basic parameters for the acquisition of capabilities. These parameters plus adoption of farming best practices are complementary flows required to sustain upgrading.

In addition to the capability, motivation is equally important to ensure commitment of smallholder farmers to consistently supply the product of the required standards. This will depend on the incentives behind such an activity. Incentives in agricultural activities, according to USAID (2006) include price of the output, net returns, infrastructure, payment mechanisms and institutional issues.

This framework is constructed under the assumption that contractual arrangements facilitate interaction between suppliers (smallholder sugarcane growers), buyers (processors) and other stakeholders of the value chain (e.g. associations, cooperatives) to enhance weaker actors (smallholder sugarcane growers) towards upgrading opportunities in the value chain. The main actors who can facilitate smallholders to upgrade are processors, associations, public and private institutions. But this depends on how the contractual arrangement is coordinated. Does it facilitate a win-win interaction between smallholder farmer and processor? It might not be easy to have such interaction given conflicting interests and different powers and competences possessed by some of the actors in the value chain. These different bases of power and capabilities might distort the perceived interaction and consequently the upgrading opportunities. If smallholder farmers do not get such services from these actors quality and quantity of sugarcane will be lowered and hence unlikely to attract more investments and consequently low incomes to farmers. For the purpose of simplifying the analysis the

USAID (2006) and Humphrey’s conceptualisation of upgrading analysis as adopted and modified where the capabilities and incentives to achieve process upgrading are presented in Figure 3.1.

Figure 3.1: The analysis framework for process upgrading



Source: Modified from Humphrey (2004); USAID (2006)

From the framework; availability of training, extension services, and best farming practices are the basis for human capability development in terms of knowledge acquisition. Agro-input provision, credit access, investment and R&D are the basis for physical capability enhancement. Both human and non-human physical capabilities are the parameters that enhance the achievement of competitiveness in the chain. Similarly, price of the output, availability of supply, infrastructure and logistics, payment mechanisms and institutions are the incentive parameters that motivate farmer’s decision to commit time and other resources into sugarcane production. Therefore, assurance of such parameters from CF arrangements according to the literature would guarantee farmers from upgrading their processes reflected by the persistence increase in quality and quantity of cane yields.

Contract farming services (indicated in the framework) are important to smallholder farmers, particularly, sugarcane growers in the study area based on social-economic

status of the smallholder cane growers and the agronomic nature of the crop itself. Ecologically, sugarcane crop requires supply of water ranging from 1200 – 1500mm per annum. At Kilombero for example, where annual rainfall could be as higher as 1500mm per annum, yet sugarcane belonging to the Company Estates is irrigated because rainfall is unevenly distributed. Most rainfall is restricted to the period between March and May, therefore, supplementary irrigation becomes necessary for optimal yields (Tarimo & Takamura, 1998). Thus, investment in irrigation facilities for smallholder farmers' fields is inevitable in order to improve production and productivity.

On the other hand, sugarcane is usually produced from the stem cuttings called setts. These setts are then placed in the deep furrow of about 6” deepened by a ridging machine onto the soils tilled and harrowed by farming equipment such as tractors and harrows. The setts develop into shoots, tillers and then develop into plants which need to be weeded three rounds, pesticides applied two times and fertilizers applied before it grows enough to shade and choke out most weeds. Once sugarcane is mature enough to be harvested, the harvesting process starts by burning the crops in the field, cutting, loading using special cane loaders and hauling to factory gates using special hauling trucks accepted and registered by the miller. Every stage in the production process requires technological capability, and crop specific knowledge. Thus, investment in both human and capital goods is equally important.

In fact, smallholder sugarcane farmers in Kilombero and Turiani just like other smallholder farmers in SSA, have poor agricultural income base and are constrained by many aspects such as lack of knowledge and skills related to crop management and have limited capacity to obtain inputs (Poulton *et al.*, 2005; M4P, 2005). Thus, smallholders cannot stand competitively alone in sugarcane production without support from the processors, NGOs, public or private institutions and financial institutions to make such huge investment expenditure in capital goods like agricultural tractors, cane loaders, bulldozers, irrigation facilities and other equipment like ploughs, harrows, cultivator ridges and cane trailers. Otherwise it would be difficult for them to participate competitively in sugarcane cultivation. Therefore, the conceptual framework (Figure 3.1) highlights some parameters with which smallholder farmers' capacity building and

incentive provision should focus. Otherwise, contract farming arrangements, under which there is assured market with guaranteed prices and embedded services like input supply, access to credit, technical support and supply of capital input (Mitchel *et al.*, 2009) could be a solution to the smallholder farmers' incapability.

3.5 Methodological issues

The analysis of cases was a phase two activity which involved an in-depth interview to the selected respondents in the value chain. It was a purely qualitative study aimed at evaluating the role of contractual relationships in facilitating smallholder farmers' upgrading. The analysis of cases was preceded by a survey involved 400 sugarcane outgrowers who were interviewed from Kilombero and Turiani in Morogoro, areas potential for sugarcane cultivation under contractual arrangements. The research employed a qualitative study design because the concepts which determine the farmers upgrading in the sugarcane value chain were difficult to quantify. Indeed, this objective was not meant for generalisation purposes. The objective was more about getting in depth insight of smallholder farmers upgrading in the contractual relationships through players-interaction.

3.5.1 Sample size and sampling procedure

A total of 59 respondents drawn from four units of analysis were employed in this study. Unlike the sample size for quantitative analysis, the sample size for qualitative analysis was considered adequate because it was an exploratory study in which large sample was not necessary. The units of analysis involved included various key chain actors namely smallholder sugarcane outgrowers and owners of the processing factories together with key informants from facilitating institutions such as farmer organisations, local governments and Sugar Board of Tanzania. For detailed information on sample size and sampling procedure refer to Section 2.5.

3.5.2 Data collection methods

In-depth interviews

In-depth interviews were carried out to the key informants (producers and processors) and key facilitating groups who were managers of the associations/ cooperatives, and top officials from the government as well as Sugar Board of Tanzania (see Table 2.1). This method involves direct face to face conversation between the interviewee and interviewer. The method was adopted because of its ability to increase the response rate and control over the respondents' eligibility. Using this method it is possible to know what person in the household is eligible to participate in the interview, when and what to respond. It is also one of the methods used to reduce research instrument bias (Daniel, 2012).

Documentation

Documented information from sugar processing companies' and associations' profiles, newsletters and written contract agreements including weekly, monthly, and yearly reports regarding production trends were collected. However, some documents pertaining sugar prices, or profit and loss accounts were treated as confidential documents. It was unfortunately that researcher couldn't get access to them.

Observations

Direct observations were made during field visits of both smallholder farms and factory owned estates. Observations in associations' offices and yards for farming implement, sugar processing factory premises, both estate and growers' cane fields were also done. Since the visit was conducted during harvesting season, researchers had an opportunity to witness harvesting process as well as harvesting tools used. Based on these observations, the observational evidence in form of photos were collected and presented.

3.5.3 Data management methods and data analysis

Qualitative analysis has been among the toughest assignment in the art of writing. Yin (2003) argues that data analysis consists of examining, categorising, tabulating, testing or otherwise recombining both quantitative and qualitative evidence to address the initial

propositions of a study. According to this author, there are five techniques used for analysing case studies, namely: pattern matching, explanation building, time series analysis, logic models, and cross-case synthesis. This study employed multi-case design, hence, a cross-case synthesis was adopted in analysing case study evidence

Assessing process upgrading possibilities in CF arrangements was done by evaluating two aspects, capability for upgrading and incentives for upgrading. The review of whether there was possibility of smallholders' upgrading of their production processes, key parameters were examined. The examination was done by merging outcomes from four subcases imbedded in each of the two holistic cases (Kilombero and Turiani). Outcomes from each subcase as nit of analysis were converged to determine the overall replication or theoretical replication of the study. Key parameters from each aspect (Table 3.1) were assessed by using perception from different units of analysis and compared to those perceptions across cases. The responses from respondents across all subcases were presented in matrices and diagrams, potential boxes, direct quotes from respondents and in the form of photographs.

Table 3.1 Description of the ‘capability’ and ‘incentive’ parameters for process upgrading

Parameters	Indicators and Description
A: Capability for process upgrading	
Learning process	<ul style="list-style-type: none"> - Learning process was indicated by availability of training and / or extension services. Such services generate knowledge & skills necessary for viable decisions and assumed to have positive influence on process upgrading - Production process best practices such as proper agro-input application and optimum management practices such as weeding, fertilizing, and harvesting were considered potential of learning process, and promote knowledge base necessary to improve production and productivity.
Acquisition of capabilities	<ul style="list-style-type: none"> - Investment in development infrastructure such as irrigation facilities, and procurement of farming, harvesting and transportation equipment strengthen capability of farmers - Provision of services such as agro-inputs and access to credit helps to solve capital and financial constraints facing farmers - Private and public R&D for smallholder sugarcane development has positive on impact productivity as result of innovation.
B: Incentives for process upgrading	
Prices	<ul style="list-style-type: none"> - Remunerative prices per MT of sugarcane was used as indicator of incentive for upgrading. Price is a strong determinant of value chain competitiveness, whereby low prices may reflect low quality, low sugar content, or inconsistent of quality
Availability of cane supply	<ul style="list-style-type: none"> - Availability of sugarcane supply was indicated by consistent increase in sugarcane output at individual level. Increase in supply depends to a large extent on the amount of land in production and production yield. The reliability of sugarcane is also an important indicator of supply competitiveness
Payment mechanisms	<ul style="list-style-type: none"> - Payment modalities and timing of payment strongly determine competitiveness in the value chain. Without financial capability in due time, schedules for implementation of economic activity could be distorted.
Infrastructure and logistics	<ul style="list-style-type: none"> - Efficiency and availability of harvesting, loading and transportation to move sugarcane from farm gate to milling station, including efficiency of the mills operations create great incentives to producers.
Institutional issues	<ul style="list-style-type: none"> - Enforcement mechanisms in the contractual arrangement can have positive or negative influence on competitiveness.

Source: Researcher’s own perspective.

3.6 Results and discussion

The objective of this chapter was to highlight whether CF arrangement deliberately or spontaneously facilitates or obstructs upgrading of production processes among smallholder cane growers and factors behind. The assessment of farmers’ capability for

process upgrading was carried out using the following upgrading sub-parameters: availability of training; access to extension services; access to credit; adoption of best farming practices; and availability of production and marketing information. Assessment of incentive parameter was carried out using the following sub-categories of incentive: price of sugarcane; availability of supply; payment mechanisms; infrastructure and institutional issues. The results on the pattern of farmers' capability and incentive parameters towards process upgrading are presented in the subsequent subsections. This is followed by a section that discusses the results in order to establish whether cane growers upgraded their production processes or not.

3.6.1 Results

Implementation of contract farming arrangement in Kilombero and Turiani involves different participants such as farmers, processors, and other stakeholders such as outgrowers' associations and cooperatives, subcontractors, government institutions like Sugar Board of Tanzania and Ministry of Agriculture, Food security and Cooperatives. According to the literature various stakeholders have the mandate to inspire the smallholder farmers to acquire capabilities and incentives for successful sugarcane production. The findings from the qualitative analysis are presented in tabular form, percentile, frequency counts, illustrative boxes, and direct quotations from respondents regarding capability and incentive parameters for process upgrading.

3.6.1.1 Capabilities for process upgrading in sugar value chain

Theoretically, capabilities for process upgrading such as provision of input, credit facility, extension services and training were considered to be included in the CF arrangement. The finding indicates that all capability parameters were not part of the package of the agreement. In other words, contract in the study area covered cane supply agreement only. The agreement bore no provision for the production process. However, with the presence of market oriented agreement, other stakeholders such as farmer associations, NGOs and government institutions were motivated to facilitate training, provision of credit, and supply of input to farmers. Table 3.4 indicates that 21 respondents (37.5%) out of 57 respondents interviewed from all units of analysis

(farmers, farmer group leaders, outgrowers' associations and processors in both areas agreed that they received training on farm management, while 62.5% affirmed that they did not receive any kind of training. Out of those who asserted that they did not receive training 77.3% were from Turiani and 48.6% were from Kilombero. Responses from farmers on the same question i.e. whether they received training or not were as follows: 56.2% agreed that they received training in Kilombero (Table 3.2); and 18.75% for Turiani (Table 3.3). Likewise, for group leaders and representatives from associations' management in Kilombero, 16.7% and 58.3% respectively, agreed that they received training in farm management. Whereas in Turiani group leaders who received training were 66.7% and no association leader received training (Table 3.3).

Those respondents who received training acknowledged that the training was conducted by ILLOVO, SUDECO, Sugarcane Research Institute based in Kibaha, and Daipesa. But respondents admitted that training was conducted once and a long time ago. It was also noted that majority of those few individuals who happened to receive training in Turiani were either leaders of groups or had any position in the community. For those without leadership positions could not receive any kind of training for the past four years especially in Turiani.

With regard to easy access to extension services, 4.2% of 57 respondents across all units of analysis in both areas agreed that they accessed extension services, and 95.8% admitted that they did not access extension services (Table 3.4). Out of those who did not access extension services 80% of respondents were from Kilombero and 95.5% were from Turiani. Concerning with easy access to credit specific for sugarcane development, 74.3% of respondents agreed that credit access was easy in Kilombero, and 31.8% in Turiani. Responses from farmers alone for the same topic in Kilombero showed that 68.7% agreed that it was easy to access credit, while for Turiani it was 31.2%.

Table 3.2: Perception towards incentives and capability parameters for Kilombero

Category	Perception	Percentages				All units N=35
		Farmer N=16	Groups N=6	Miller N=1	Assoc. N=12*	
<i>Incentive</i>						
Pricing arrangement	Fair	37.5	66.7	100	50	48.6
	Unfair	62.5	33.3		50	51.4
Quantity of produce	Increasing	12.5	16.6	100	8.3	14.3
	Decreasing	62.5	66.7		75	65.7
	Fluctuating	25	16.6		16.7	20
Rendement determination	Fair	25	16.7	100		17.1
	Unfair	75	83.3		100	82.9
Payment duration	Timely	31.2	33.3		8.4	22.8
	Delayed	68.8	66.7	100	91.6	77.2
Infrastructure (availability and efficiency of harvesting equipment)	Yes			100	16.7	8.6
	No	100	100		83.3	91.4
Enforcement effectiveness	Ineffective			100	16.7	8.6
	Absent	100	100		83.4	91.4
<i>Capability</i>						
Training on farm management received	Yes	56.2	16.7	100	58.3	51.4
	No	43.8	83.3		41.7	48.6
Easy access to Extension services	Yes	18.7	16.7		25	20
	No	81.3	83.3		75	80
Input supply timely	Yes				33.3	11.4
	No	100	100	100	66.7	88.6
Production information	Yes				16.7	5.7
	No	100	100	100	83.3	94.3
Input fertilizer applied adequately	Yes		20		16.7	8.6
	No	100	80			91.4
Easy access to credit	Yes	68.7	66.7	100	83.3	74.3
	No	31.3	33.3		16.7	25.7
Knowledge of measurement of rendement	Yes			100	16.7	8.6
	No	100	100		83.3	91.4
Understanding price calculation	Yes	25	33.3	100	8.3	22.8
	No	77	66.7		91.7	77.2

Source: Calculated from POLICOFA (2012) interview data

* Two (2) associations: Kidatu Ikea Cane Growers (KICGA), and Sanje Cane Growers (SCGA) were dropped from the analysis, had missing responses may be because they were newly established associations. KICGA was registered in 2011, while SCGA was registered 2012/13.

Regarding best production practices which were measured by the amount fertilizer application, neither farmers from Turiani nor from Kilombero agreed that they have applied input fertilizer adequately (Tables 3.2 & Table 3.3). Similarly, the availability of production and marketing information to the smallholder sugarcane growers according to the findings seems to be a problem. Most of the farmers interviewed were not aware

neither of how price is determined nor how rendement is measured. Table 3.2 indicates that 25% of outgrowers in Kilombero understood how price was calculated but none of farmers had knowledge about rendement determination. One respondent argue “we do not know what exactly this rendement is and our leaders do not know either, this is a real problem for us...” Adding to this quotation, another respondent at national level from Ministry of Agriculture asserted that pricing of sugarcane is a problem. Many farmers are used to fixed prices and do not know that market price fluctuates. In the negotiations on prices farmers seem to think that prices always should reflect ‘their efforts’. Table 3.3 on the other hand, reports finding on the same topic for Turiani outgrowers. The Table informs that 12.5% of outgrowers were knowledgeable on price determination, but none of the outgrowers knew how rendement was determined. Similarly, none of the outgrowers had regular information about sugarcane production. These findings from the respondents reveal that there is information dissemination problem in the contractual arrangements. This finding tallies with Prowse (2012) who concluded that information and communication blockages exist in CF arrangements, and in order to foster competitiveness, producer organisations should facilitate knowledge sharing between members to deeply integrate them in the value chain.

Table 3.3: Perception towards incentives and capability parameters for Turiani

Category	Perception	Percentages				All units N=22
		Farmers N=16	Groups N=3	Miller N=1	Assoc. N=2	
<i>Incentive</i>						
Pricing arrangement	Fair			100		4.5
	Unfair	100	100		100	95.5
Quantity of produce	Increasing					
	Decreasing	100	100	100	100	100
	Fluctuating					
Rendement determination	Fair			100		4.5
	Unfair	100	100			95.5
Payment duration	Timely					
	Delayed	60	100	100	100	70.9
	Extreme delay	40				29.1
Infrastructure (availability and efficiency of harvesting equip.	Yes					
	No	100	100	100	100	100
Enforcement effectiveness	Effective					
	Ineffective			100		4.5
	Absent	100	100		100	95.5
<i>Capability</i>						
Training on farm mgt. received	Yes	18.75	66.7			22.7
	No	81.25	33.3		100	77.3
Easy access to Extension services	Yes	6.2				4.5
	No	93.8	100		100	95.5
Input supply timely	Yes					
	No	100	100	100	100	100
Production information	Yes					
	No	100	100	100	100	100
Input fertilizer applied adequately	Yes					
	No	100	100	100	100	100
Easy access to credit	Yes	31.2			100	31.8
	No	68.8	100			68.2
Knowledge of measurement of rendement	Yes			100	100	13.6
	No	100	100			86.4
Understanding price calculation	Yes	12.5	33.3	100		18.2
	No	87.5	66.7		100	81.8

Source: Calculated from POLICOFA (2012) interview data

Capabilities in undertaking agricultural activities can also be acquired through investing in infrastructure development, and in research and development (R&D). Result presented in appendix I show that ‘no’ response on investment in the development of infrastructure such as irrigation facilities at farm level and at association level dominates across units. This implies that there was no investment on irrigation facilities in the study areas done either by smallholders or by associations on behalf of their members. This means that smallholder farmers in Kilombero and Turiani depend entirely on unreliable rain-fed agriculture, which highlights that smallholder farmers are prone to risks associated with weather fluctuations. But for the case of millers, the story is

different, the companies have spent much money in developing irrigation infrastructure to serve their sugarcane fields during drought. This observation is consistent with FAO (2013) which finds that Mtibwa and Kilombero sugar farms are fully installed with sprinkler irrigated system drawing water from well designed and extended canals and other irrigation facilities like power supply network. The investments done by the sugar companies are not limited to irrigation facilities; MSEL for example has also invested heavily in land acquisition of approximately 2500 hectares and dam construction in Dakawa (MSEL projection, 2012).

Equally, investment in farming equipment such as harvesting, loading and transportation equipment seemed to be a big problem to some of the associations. With the exception of Ruembe Cane Growers Association located in Ruembe area, the rest of the associations depended entirely on contractors' equipment for harvesting loading and transporting sugarcane from farm gate to the mills. In fact investment cost in the sugarcane subsector is high, needed strong and well established association. Since most of the associations in the study areas were less competent in capital goods acquisition almost all tasks from cutting, loading, and hauling were subcontracted on behalf of growers. But, and very unfortunate most subcontractors were not competent enough to undertake all the responsibilities assigned to them (cutting, grabbing, and hauling), indeed the majority also owned sugarcane fields which created conflict of interest during harvesting operations. As result smallholders were marginalised as they stood at a second priority.

Theoretically, private and public research and development (R&D) for smallholder sugarcane development is a key determinant for innovation at farm and industry level. The government of Tanzania by knowing the power and importance of R&D in creating competitiveness in the industry, established two research institutions specifically for all research matters related to the development of the sugar industry. These research centers include Sugar Research Institute (SRI) based in Kibaha and National Sugar Institute (NSI) based in Kidatu both enjoy support from the government and other sugar industry stakeholders. According to the situation analysis of the Tanzania sugar industry which reviewed the Sugar Industry Development Plan and Strategy for 2001/02 – 2010/11,

there was no any research activity that was undertaken for the entire period of the strategy (2001 – 2011) related to smallholder farmers’ capacity development in the study areas. Similarly, nowhere in the plan indicates expenditure provision for any research activity done or planned to be done by any of the research institutions. This could be an indication that R&D for outgrowers’ development was not given priority even at national level.

3.6.1.2 Incentives for upgrading in the contractual arrangement

Table 3.4 on the other hand indicates that 75% of all respondents across cases except processors state that pricing arrangements were unfair. Pricing arrangement encompasses pricing procedures such as grading, cane-weighing and cane laboratory analysis, which were among the terms in the cane supply agreement. Farmers’ responses alone in Kilombero 37.5% affirmed that pricing arrangement was fair, while in Turiani neither farmers nor association leaders agreed that pricing arrangement was fair. Meanwhile, 100 % of processors stated that pricing arrangement was fair (Table 3.4).

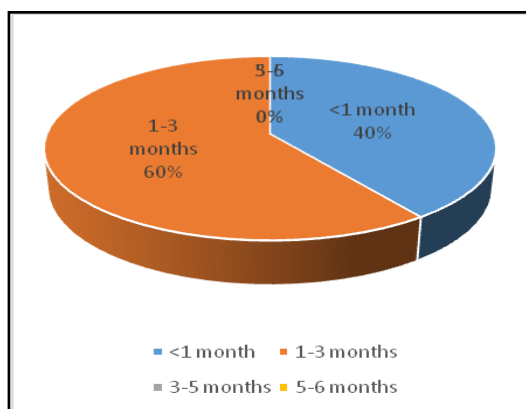
With regard to the perception pertaining to the trend of quantity of produce supplied, i.e. trend on the availability of sugarcane supply, result from Table 3.4 indicates that 100% of all respondents (farmers, group leaders, association leaders, and processors) in Turiani confirmed that quantity of sugarcane or cane supply exhibited a declining trend overtime. But for Kilombero there was mixed perception, 65.7% argued that cane supply was declining, 20% perceived that the trend was fluctuating, and 14.3% state that trend was increasing. Likewise, FAO (2013) observed similar finding in which sugar production in Kilombero and Turiani declined from 246 tons in 2005 to 179 tons in 2011 due to declining sugarcane yields.

Several reasons were identified regarding declining trend in sugarcane production. Table 3.5 illustrates that in Kilombero 16.7% of the group leaders cited delay in payment, 33.3% low cane price, 16.7% small DRD, and 33.3% fire accident. Whereas, 31.2% of farmers pointed out low rendement, 18.7% both bad harvesting management and low cane price, 6.2% small DRD and accident fire. In Turiani 33.3% of group leaders cited delay in payment, bad harvest management, and weight cheating. On other hand, 50% of

farmers in Turiani informed delay in payment as major constraining factor towards sugarcane production, 6.2% cited low rendement, 25% bad harvest management, and 12.5% low cane price.

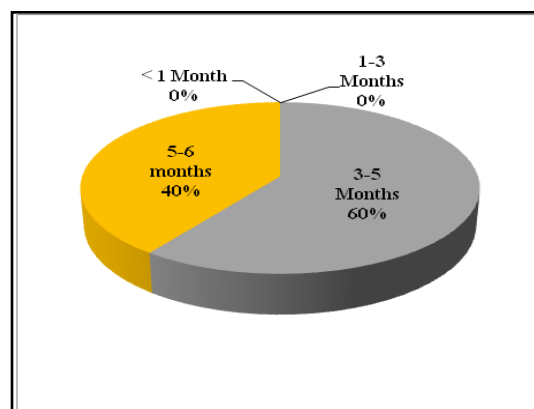
Pertaining to the payment modalities, including payment duration, Table 3.4 reports that 22.8% of all respondents across all units of analysis in Kilombero acknowledged that payments for the sugarcane delivered to the mills were timely effected, 77.2% argued that payments were delayed. Whereas in Turiani none of the respondents agreed that payments were effected timely, 70.9% of all respondents argued that payments were delayed and 29.1% stated that payments were extremely delayed. Those who said that payments were delayed, 60% from Turiani argued payment was effected between 3-5 months, and the rest 40% affirmed that the payment was realised extremely late between 5-6 months or even more. In Kilombero it was observed that most farmers (65%) argued that payment was usually realized between 1-3 months while others (35%) stated that payment was effected within a month (Figure 3.3a & 3.3b)

Figure 3.2(a): Duration taken to effect payment in Kilombero



Source: POLICOFA data (2012)

Figure 3.2(b): Duration taken to effect payment in Turiani



Source: POLICOFA data (2012)

Concerning infrastructure and logistics, that is availability and efficiency of harvesting, loading and transportation equipment the finding revealed that 8.6% of respondents agreed that equipment were available and efficient in Kilombero. In Turiani no respondent agreed on the availability and efficacy of the equipment (Table 3.4). In this case, farmers depended on subcontractors to do cutting, loading, and hauling of the

smallholders' cane. But subcontractors were not competent enough to perform all the functions. Similar observations were documented in the Tanzania Sugar Industry Development Plan and Strategy (2011/12 – 2015/16). According to this document, it is estimated that 10% of the crop is left in the fields unharvested annually due to poor infrastructure and logistics.

Table 3.4: Perception towards incentives and capability parameters across cases

Category	Perception	Percentages		
		Kilombero N=35	Turiani N=22	Both areas N=57
<i>Incentive</i>				
Pricing arrangement	Fair	48.6	4.5	25
	Unfair	51.4	95.5	75
Quantity of produce	Increasing	14.3		6.2
	Decreasing	65.7	100	75.1
	Fluctuating	20		18.7
Rendement determination	Fair	17.1	4.5	16.3
	Unfair	82.9	95.5	83.7
Payment duration	Timely	22.8		16.6
	Delayed	77.2	70.9	48.0
	extreme delay		29.1	35.4
Infrastructure (availability and efficiency of harvesting equipment	Yes	8.6		6.2
	No	91.4	100	93.8
Enforcement effectiveness	Effective			
	Ineffective	8.6	4.5	6.2
	Absent	91.4	95.5	93.8
<i>Capability</i>				
Training on farm management received	Yes	51.4	22.7	37.5
	No	48.6	77.3	62.5
Easy access to Extension services	Yes	20	4.5	4.2
	No	80	95.5	95.8
Input supply timely	Yes	11.4		2.1
	No	88.6	100	97.9
Production information	Yes	5.7		4.2
	No	94.3	100	95.8
Input fertilizer applied adequately	Yes	8.6		6.2
	No	91.4	100	93.8
Easy access to credit	Yes	74.3	31.8	10.4
	No	25.7	68.2	89.6
Knowledge of measurement of rendement	Yes	8.6	13.6	8.3
	No	91.4	86.4	91.7
Understanding price calculation	Yes	22.8	18.2	22.9
	No	77.2	81.8	77.1

Source: Calculated from POLICOFA (2012) interview data

Table 3.5: Reasons for the decrease in output

Items	Kilombero				Turiani				Assoc. n=2 %		
	Farmers		F. Group		Assoc.		farmers			F. Group	
	Freq. n=16	%	Freq. n=6	%	Freq. n=12	%	Freq. n=16	%		Freq. n=3	%
Delay payment			1	16.7	1	8	8	50	1	33.3	50
Low Rendement	5	31.2					1	6			
Bad harv. Mgt.	3	18.7					4	25	1	33.3	
Low cane price	3	18.7	2	33.3			2	13			
Weight cheating	3	18.7							1	33.3	
Too small DRD	1	6.2	1	16.7	8	67					
Fire accident	1	6.2	2	33.3							
Much deductions							1	6			
Miller's power					3	25					50

Source: POLICOFA interview data (2012)

Table 3.6: Perception towards factors constraining sugarcane production under CF

Response group	Kilombero		Turiani	
	Constraining factors	Most constraining	Constraining factors	Most constraining
Farmers	Low rendement Bad harvest mgt. Low cane price Weight cheating Too small DRD Fire accident	Low rendement Bad harvest mgt. Low cane price Weight cheating	Delay payment Low rendement Bad harvest mgt. Low cane price Too much deductions	Delay payment Bad harvest mgt. Low cane price Much deduction
Farmer groups	Delay payment Low cane price Too small DRD Fire accident	Low cane price Fire accident	Delay payment Bad harvest mgt. Weight cheating	Delay payment Bad harvest mgt. Weight cheating
Associations	Too small DRD Miller's power Delay payment Low cane price Unstable price	Small DRD Miller's power	Delay payment Miller's power Fire accident Factory capacity Low cane price	Miler's power Low cane price Delay payment Factory capacity

Source: POLICOFA interview data (2012)

Results presented in appendix I regarding CF arrangements show that farmers, farmer group leaders and association leaders had no influence over contractual arrangement i.e. no one could possibly enforce defaulters of the agreement. One of our respondents at national level acknowledged that there was a large extent of mistrust resulted from failures to fulfill obligations clearly stated in the agreement, but neither legislations nor national policies resolved. The respondent added, the Ministry of Agriculture and Food Security did not play direct role in the contract farming arrangements which was

translated as lack of enforcement mechanism in the business between outgrowers and processors.

Lack of enforcement in CF arrangements can be associated with the absence of formal and / or informal regulations designed to govern the contractual arrangements. The law and regulations governing the sugar sector focuses mainly on quality control by dealing with issues patterning to sugarcane growers' registration, and sugarcane husbandry with more focus on protecting millers' interests.

For instance, with regard to registration of sugarcane outgrowers, the Sugar Industry Act 2001, Part II Article 3(2) establishes grower's registration number (GRN) upon registration of the outgrower to a particular sugar mill. In that respect no grower was allowed to grow and supply sugarcane to a sugar mill which was not registered to (see Article 4(1)). At the same time Article 4(2) prohibited a miller to procure sugarcane for manufacturing sugar from unregistered cane grower. Likewise, the regulation was clear on the consequences for any person who contravened the provisions of the regulation (see Article 4(3)). The problem with this provision for registration was that a monopoly kind of market was created to which the miller had full mandate on whatever decision regarding marketing of sugarcane. This was due to the fact that the regulation did not provide alternative market outlets in case of good year when there was high harvests or in case of factory breakdown.

Similarly, the Sugar Industry Act 2001, directed sugarcane growers to carry out sugarcane farming activities in the most efficient manner and comply with good agricultural and management practices, also comply with any advice or directions on cane husbandry given to them (see Part III Article 10(1&2)). The regulation also insisted on the use of approved variety of seed cane (Article 11(1-3)). Unfortunately, the Act was silence on how and where the grower could obtain such services, advice, or directions related to good cane husbandry. In this regard, no institutional framework which safe guided farmers from production risks e.g. crop rejection in case of poor quality caused by reasons beyond their reach.

From contract enforcement to regulations, sugarcane outgrowers were left in dilemma. They did not understand what to do especially when the miller did not comply with the agreement. The only possible solution to smallholder farmers who were the most vulnerable group was to step out of the sugarcane business when they felt unsatisfied with the buyers' actions, and this was what happened in Turiani. Such practice was regarded as a kind of disincentive in promoting upgrading for farmers engaged in CF arrangements.

3.6.2 Discussion

3.6.2.1 Is process upgrading happening?

The objective of assessing the pattern of capability and incentive parameters for process upgrading among sugarcane growers in the study area was to establish whether upgrading was realised or not. The analysis was guided by the research question “what aspects of CF facilitate or obstruct growers from upgrading their production process?” Based on qualitative analysis results presented in the previous section, there was limited scope for the small farmers' acquisition of capability and incentive for greater facilitation of process upgrading adoption. All parameters that have been recognised by literature as sources of learning process and acquisition of capabilities were not fully realized in the contractual arrangements in the study area. Majority (88.7%) of farmers in Turiani were not availed with any kind of training, extension services, or credit facilities, and for Kilombero it was 71.3% of all farmers interviewed.

Likewise, results highlighted the most compelling reasons for the underperformance of smallholder farmers in their production process which included low rendement, low sugarcane price, delayed payments, bad harvesting management, too small DRD, and weight cheating. Some of these reasons might be the consequences for the lack of capability among sugarcane growers. For instance low rendement could be a reflection of poor product quality resulted from poorly managed crop. Box 1 highlights a scenario indicating how difficult it was for smallholder farmer's deliveries to receive rendement worth 10% level or above. The information in the box was obtained from one of our

respondents who showed an invoice testifying how difficult it was for her to obtain rendement worth 10% or above.

Box 1: A testimony on how difficult was to obtain rendement worth 10% to some companies

The respondent was asked to tell his first-hand experience on rendement determination and show the trend of the rendement received in the past 12 months from the date of interview. Respondent started by saying that the tons of canes received for crashing are usually known. In the 2011/12 season for example, a total of nine plots belonging to the respondent were harvested and delivered to the factory. In the 1st plot harvested, 53.86 tons of sugarcane were obtained and fetched 6% rendement; the 2nd plot with 230 tons, fetched 8.2% rendement; the 3rd plot with 141.64 tons received 7.9% rendement; the 4th plot with 10.02 tons fetched 8.8% rendement; the 6th plot having 53 tons of sugarcane fetched 7.8% rendement; the 7th plot had 29.14 tons and received 7.6% rendement; the 8th plot had 12.06 tons with 9.1% rendement and the 9th plot with 8.74 tons fetched 7.9% rendement (MOA Cane Growers Invoice dated 31/01/2012). He added “It is common to see cane growers receive an invoice bearing zero percent rendement. In 2009/10 season for example, a total of 200 growers received zero rendement”.

The information in Box 1 reveals that it was difficult for a farmer to receive rendement worth 10% level, the cut-off point according to the contract. Low rendement which leads to low prices coupled with high production costs, prohibits 88.7% of outgrowers from adopting best production practices. As a result, there has been a continued habit among growers to harvest unmanaged sugarcane fields continuously without replanting. Similar findings were obtained by Matango (2006) whose study was as quoted, “...farmers’ cane fields are not weeded, costs rise as weeds intensify and canes produce little tonnage, low sucrose without nutrients, and finally fetch little money to farmers” (p.11). In a situation where cane delivered for purchase is not of good quality, it becomes difficult to establish whether the cause is bad cane husbandry or sloppy harvest management when contractor and the association do not deliver on time. All in all, it does not matter whether poor crop quality is due to failure in crop management or any other reasons. Any act compromising the product quality denies clause 5.2.2 of the agreement between outgrowers (OGs) and processors which requires that all cane delivered to the mill must be in a good, clean and fresh condition substantially free of trash, tops, dirt, and roots collectively, and must in all respects be suitable and ready for milling and processing (MOA Cane Supply Agreement, 2011:7).

Similarly, cane supply agreement requires that poor quality cane should not be harvested from the fields. Thus, harvesting poor quality cane and assign it low rendement denies

the harvesting protocol which requires that sugarcane should be tested in the laboratory to confirm both crop-maturity and crop-quality before burning and cutting processes. Based on 2009/2011 agreement between outgrowers in Turiani and MSEL, it is theoretically agreed that sugarcane should be accepted for delivery to mill if it has first expression juice purity (FEJ) of not less than 80% tested before harvest. In practice, outgrowers' sugarcane sampling procedures are conducted after all harvesting operations such burning, grabbing, and hauling have already been done. Upon arrival to the mill-gate, sugarcane sampling procedures are carried out as follows:

- (i) Cane is weighed at the weigh bridge, and the following data are compiled and fed in the computer: name, outgrower number, and location from where the cane is harvested.
- (ii) At least five cane trucks (total of approximately 50 tons of cane) passing through the weigh bridge from the same location and date are given one/ same cane secret code number.
- (iii) The cane secret code number tag is given to the cane yard sample-boy/ girl for follow up. The heap of the said 50 tons of cane is fed on the feed table and the sample-boy/ girl traces the trend of cane passing through the shredder to first mill where the juice sample is collected.
- (iv) After collecting the juice from the first mill, the tag is submerged in the sample container, preservative is added from the first mill to avoid juice deterioration and sent to the laboratory for analysis
- (v) By the use of saccharomat and computer analyst notes and inputs the sample number and date of when the cane was supplied to factory from the field – read from the tag, and saves all juice quality (Blix, pol & apparent purity) for further calculation procedures.
- (vi) The day of executing the calculations, IT member copies the weekly information from the weigh bridge system and links them to outgrowers' network system.

- (vii) All cane delivered from different locations and does not weigh to at least 40-50 tons are assigned average rendement of the outgrowers of the specific day/date
- (viii) Cane weight notes are made available to the cane grower and cane transporter
- (ix) Rendement reports are made available to farmers association after calculation execution.

Outgrowers cane rendement calculation is executed as follows:

$\text{Brix} - \text{Pol} = \text{Non Sugars (N.S)} \text{ (From outgrower cane juice sample)}$

$\text{N.S} \times \text{molasses factor} = \text{corrected N.S.}$

$\text{Pol} - \text{Corrected N.S} = \text{Corrected Pol}^1$

$\text{Corrected Pol}^1 \times \text{juice factor} = \text{Rendement}$

Where: Molasses factor = Final molasses app.pty/(100 – final molasses average app.pty of the week)

Juice factor = week factory rendement/ corrected pol² (week average factory first expressed juice)

Therefore, such practice violates the agreement and exposes outgrowers to the marketing risk because rendement outcome is uncertain for them to be sure of their sales.

Apart from the problems related to rendement determination, harvesting operations have also frequently been cited by respondents across cases. For example, bad harvesting management was cited by 18.7% of farmers in Kilombero, 25% and 33.3% of farmers and farmer group leaders respectively, in Turiani. Harvesting operations which include cane cutting, loading and hauling are often considered jointly due to the fact that sugarcane must be transported to the processing facilities within hours of harvesting to avoid spoiling. Normally, farmers assume the cost of cutting, grabbing and hauling, but they have no real control over the harvesting operation schedules.

During survey, farmers reported harvesting delays of up to one year or more for the mature cane due to favoritism problem. Other farmers could see that their fields were not harvested for consecutive years while others had their fields harvested every year. One of the respondents in Kilombero quoted saying “favouritism in harvesting is an immense problem and something has to be done to rescue the organisation of the harvest process in the area”. Similarly, a study by Kamuzora (2010) highlighted that some farmers could harvest their sugarcane every year while their names were not even scheduled, and those whose names were listed in the schedule were skipped which gave rise to allegation of bribery. Several reasons were mentioned by respondents as to why the harvesting schedule was not respected (ranked in descending order of importance):

- i. Some association leaders own large fields, up to 50 acres or more. One of the respondents claimed that the normal yield is 20 tons/acre, but if modern techniques are used the yield goes up to 40 tons/acre. This means that a leader who owns 50 acres produce a total of 2000 tones and that might take up the whole harvest quota allocated to members from that particular association and small outgrowers would have no chance of participating in the harvest.
- ii. Expansion of the out-growers. This reason was mainly cited in Kilombero where there are surplus cane fields relative to the crushing capacity of the mill. One respondent in Kilombero says “even if the general rule governing sugarcane production requires that fields should not be located more than 40km away from the factory, but some Government leaders can grow up to 200 acres more than 50km away because can afford to bring their cane to the miller directly and thereby take up space from others in the quota system, and the miller accepts these people and the associations do not dare to speak up against this”.
- iii. Daily Ratable Deliverable (DRD) was mentioned as a factor hindering the adherence of harvest schedule. DRD was also mentioned as a factor hindering cane production leading to a decrease in sugarcane supply. Results demonstrated that in Kilombero 6.2% and 16.7% of farmers and farmer group leaders, respectively perceived DRD as constraining factor towards performance. DRD is a plan for delivering predetermined daily quantity during the crushing season.

The miller allocates the DRD based on the last season's performance. But there is high mobility of farmers from one association to another with different background of production records. Sometimes an association may receive new members who might have poor performance records or who did not have sugarcane at all last season, or may receive new members who could double the last season's yields. When one among these scenarios happens, the allocated DRD based on previous records would hardly reflect the actual volume of outgrowers' sugarcane. For instance, in the year 2013/14 Mkula Cane Growers Association (MKUCGA) registered new members who joined the association and the number doubled from 210 members in 2012/13 to 457 members for the following season (2013/14) while the DRD remained the one allocated during the last season (2012/13) which was 2.83 tons per day. As result most outgrowers did not harvest their fields in 2013/14.

The DRD allocation to the individual farmer depends on: first the overall share allocated to outgrowers in their totality versus the miller. For example, in 2013/14 production season the DRD for the miller in Kilombero was 57% against 43% allocated to outgrowers. In Turiani, Mtibwa offered DRD at a ratio of 60% and 40% for miller and outgrowers respectively. Next, the share of outgrowers is further subdivided according to the size and number of registered associations and their capacity to produce. For instance, during the same season, there were 14 registered associations in Kilombero whose DRD was distributed as indicated in Table 3.7. From the DRD allocated to the association level, further distribution is done to an individual farmer within the association.

Table 3.7: DRD allocation among associations in Kilombero (2013/2014)

OG K1	DRD %	OG K2	DRD %
KCGA	58.0	RCGA	68.51
MUCGA	17.43	Muongano	11.80
KICGA	5.86	Msindazi	11.17
SACGA	2.89	MACGA	3.65
MNCGA	2.83	Bonye	3.75
AMCO	2.95	Harambee	1.12
MMLCGA	4.62		
MKUCGA	4.60		

Source: Illovo – Department of Outgrowers' Services

OG K1 implies outgrowers supplying sugarcane at Kilombero 1 factory

OG K2 implies outgrowers supplying sugarcane at Kilombero 2 factory

Therefore, DRD is important and should fairly be allocated and respected during harvesting operations to allow all growers the possibility to deliver their produce for crushing. Otherwise failure to follow harvesting schedule leads to misunderstandings and conflict among growers, associations and millers. Masuku (2011) had similar observation.

In the study areas non-adherence to harvesting schedule has made smallholder farmers grown more frustrated for years. The indicator of such frustration is the frequent decisions to circumvent rules and burn their fields before they are due to do so, causing what they call “fire accident” in order to make their crops harvested. Fire accident is unplanned burning practice which was reported in Table 3.5 and Table 3.6. From Table 3.5, 6.2% and 33.3% of farmers and farmer group leaders argue that fire accident was among the reasons for declining output. Fire accident may cause other consequences such as crop rejection because of too much harvest which may surpass the DRD of the day or simply the factory capacity. During survey several cases were observed in which planned and unplanned burnt crops were rejected. Figures 3.4a and 3.4b illustrate some of these scenarios from study cases where planned burnt sugarcane were seen left uncut in the field (Figure 3.4a), and heaps of the cut cane left uncollected to rot in the field (Figure 3.4b).

Figure 3.3 (a): Rejected burnt-cane and left uncut in the field



Source: Photograph by researchers in Turiani division under consent, 2012

Figure 3.3 (b): Heap of cane, cut and left to rot in the field



Source: Photograph in one of fields in Turiani division (under consent), 2012

From Figure 3.3a, the smallholder farmer was 42 years old and head of the household. He was engaged in cane production before and after sugar sector reforms. His canes were rejected while at the field and no grounds were provided regarding such rejection. Theoretically, crop is reject if found having low mixed juice purity or any other reason as in accordance with clause 5.2.3 of the agreement (Cane Supply Agreement, 2011).

Similarly, the miller may accept unscheduled burnt cane but with penalty. Unplanned burning practice may also affect quality of the cane because immediately after cane is burnt tend to accelerate inversion of the sucrose into glucose and fructose, ultimately it becomes useless for sugar production. Thus, to prevent sugarcane from fermenting, processing must start immediately after burning, which might not be the case if the burning was unplanned one. This finding corroborates with a REPOA study, which among others concluded that, to ensure a fair and efficient harvest rotation all cane areas in Kilombero should be divided into zones which will all be overseen by only one association operating as a trust. Likewise, delay in payment seems to affect smallholder farmers in Turiani more seriously than in Kilombero. Table 3.5 reports that 50% of smallholder farmers and 33.3% of farmer group leaders affirmed that their capability to undertake economic activities particularly in sugarcane production has greatly reduced because of delay payments. Delay in effecting payment to outgrowers for their sugarcane delivered to the mill is also reported by Nkonya and Barrero-Hurle (2012); Nazir, Jariko, and Junejo (2013). All these scenarios could be a testimony of the absence

of proper farming contract existing between smallholder farmers and processors and hence, an obstruction to process upgrading possibilities.

3.6.2.2 Aspects of CF restraining growers from upgrading their processes

Theoretically, CF arrangement is key aspect in building capacity of smallholder farmers for improving production process. On this basis one interest of this study was to examine how this arrangement had affected upgrading. This section examines how incentive and capability variables emanating from CF affected upgrading. Contrary to theory CF did not seem to be instrumental for process upgrading as summarized in Table 3.8.

Table 3.8: Constraints for upgrading in the production

Key constraints	Reasons mentioned within and across cases
Limited incentives	<p>Low, unfairly determined and dictated sugarcane prices</p> <p>Late in some occasions very late, based on unfairly quality determination payment systems</p> <p>Low production due to unreliable harvests, factory capacity limits large supply, and lack of alternative markets</p> <p>Lack of enforcement and favorable regulatory framework</p>
Limited capabilities	<p>Limited production skills due to lack of training and extension services</p> <p>Limited access to credits (serious in Turiani)</p> <p>No subsidized input e.g. fertilizer, late delivery of non-subsidized inputs</p> <p>Low application of modern technologies e.g. fertilizer due to low net returns.</p> <p>Limited investment in agricultural infrastructure e.g. irrigation facilities</p>

Source: Developed by the author (2012)

Sugarcane prices

Theoretically, price under CF arrangement is negotiated and agreed among actors before selling/buying season. Contrary to theory, price offered under CF arrangement in the study area is not a mutual agreement between OGs and millers. The buyer usually sets Price and outgrowers become price takers. Outgrowers are given a complex contract containing technical stuffs on price determination to study and decide on under great time pressure normally in the annual general meeting and often with little or no helpful information from the company. Unfortunately indeed, majority of the growers lack legal or other professional skills and cannot access to such services. Even leaders of farmers’

association could not explain how things worked. This has constrained farmers from improving their processes and highly demotivated because they assume that the price is unfairly determined, so they usually forced to sell their sugarcane at the dictated price, as nowhere one can sell sugarcane due to monopsony situation created by the regulatory framework of the country.

Payment systems

Similarly, payment is based on the quality of sugarcane, measured by rendement percentage level. As it was explained earlier on modalities for rendement determination and other measurement procedures like weighing and cane laboratory analysis are all untrusted and farmers considered unfair. Meanwhile, effecting payments late has been a norm, contrary to the agreement that requires farmers to get their payment after every two weeks from the last month of cane delivery. Yet this has not been the case, and payment has been extending to more than 3-5 months especially in Turiani as findings indicated. This negligence of adhering to the agreement has affected farmers' other economic activities such as timely weeding, fertilizing and pesticides application, including replanting and loan repayment. Generally, non-adherence to the payment modalities agreed in the CF arrangement has been a predominant chaos to farmers.

Unstable production of sugarcane

Sugarcane farmers noted during interviews that they were certain on the potential supply of sugarcane to have been declining much faster within the past 4-5 years than before especially in Turiani. Reasons mentioned by respondents as to why such trend were categorised as “incentive” reasons such as low prices and late payment, unreliable harvesting operations, factory capacity and lack of alternative markets for their produce.

Others were “capability” reasons such as lack of production skills due to lack of training and extension services, limited access to credit, low application of fertilizer due to financial constraint, and drought due to lack of irrigation facilities.

Enforcement mechanisms and regulatory frameworks

Regulatory frameworks have created a monopsony situation at which outgrowers cannot choose firms with whom to do business because the law governing the sugar sector does not provide a room for establishment of new milling factories in the area. Second, the law does not allow selling sugarcane in other millings than the one the farmer is located and normally within the radius of 40km from the existing mill.

Lack of effective enforcement mechanisms on the other side, has been a source of problems to farmers in improving their processes. For example, pursuant to clause 10.1.3.2 of the Cane Supply Agreement current in operation between MOA and MSEL, the company (MSEL) is obliged to pay an interest rate equal to 3% per annum on the overdue amount after the due date until the buyer pays the seller in full. But this is not done, and associations on behalf of the outgrowers cannot enforce. Such non-adherence to terms of agreement without reward or penalty to defaulter(s) has demotivated farmers from engaging fully in sugarcane cultivation, as result most of the sugarcane outgrowers have jumped out of the business and others are continuously getting out of the business and the rest are doing business with unmanaged farms especially in Turiani.

Generally, lack of enforcement has caused processors to relax and ignore to fulfil some of their responsibilities even the basic ones. For example, they delay even to sign the agreed contract without apparent reasons. Theoretically, contract is supposed to be signed on 30th April of each year. As an example, during phase one and period one of data collection in Turiani, until the date of interview (19th July 2011), the 2010/2011 contract was not yet signed by MSEL in Mtibwa, and the respondent was quoted claiming;

Imagine this contract documentation is supposed to be in use for the operations just started³, yet it is not signed, and unfortunately we cannot do anything, because one time we used to go to court but no action and or justice was observed. We finally called for the Honourable Minister for Agriculture and Food Security but he refused to attend our concerns.

³ The operations in 2011 started in early May 2011

From this quote it is obvious that contract is just formalities and it has nothing to do with farmers' performance improvements.

3.7 Conclusion and policy implication

The objective of this study was to assess if CF facilitated or obstructed process upgrading and identify aspects of CF facilitated or obstructed upgrading. This study revealed that, research, training, input provision and extension services were not included in the CF arrangements although CF theory suggests inclusion of these variables because of their crucial role they play in creating smallholder farmers' capabilities. The CF in the sugar sector is just Cane Supply Agreement between Outgrowers Association and Millers. Clauses included in the cane supply agreement were supply of cane, cane delivery programme, company's obligation (crushing cane that meets specified quality). Other clauses covered were purchase price, payment modalities, cane varieties and diseases and dispute settlement. Purchase price and payment modalities were the only elements included in the agreement which were predicted by the theory as motivating factors for farmers to actively participate in the business. Unfortunately, the study revealed that the price of sugarcane and payment mechanisms decreased smallholder farmers' incentives to actively participate in sugarcane production. Price was considered very low especially in Turiani compared to Kilombero and payments were delayed and in some cases extremely delayed in Turiani relative to the agreement.

Excluding training, input provision, extension services and research in the agreement weakened the capability of smallholder farmers in undertaking sugarcane farming best practices in the study areas. Thus, there is a need to develop integrated interventions that expand producer capabilities and incentives to enhance sugarcane supply. These may include (1) the need to capitalise fully on the research and training institutions formerly established in the country purposely for sugar sector development by providing sufficient resources for conducting research and training on matters aimed at strengthening capacity of the outgrowers, promoting good cane husbandry skills and techniques related to the development of sugarcane subsector; (2) the need to intervene in CF arrangement to ensure that the state in collaboration with other stakeholders such

as NGOs, CBOs oversee the prices of both output and agro-input by setting indicative prices similar to what has been happening in other crops like cotton and tobacco. (3) The current contract farming agreement needs to be revised for the purpose of making it more binding; unlike the way it is now where stakeholders such as farmers, farmer group leaders and association do not have influence over agreement. (4) There is a need to introduce and review incentive policies and regulations to attract and retain small and larger farmers' investments in sugarcane subsector by creating alternative markets of their produce. This could be done by amending the Sugar Act 2001 to allow establishment of supplementary factories around the existing ones. (6) The government should retain part of the ownership especially for MSEL to public instead of 100% private ownership, the way it is now. Such measures could help solve the pricing and payment mechanisms including enforcement problems and reduce excessive powers vested to processors in the overall processes of contract negotiation and execution currently affecting smallholder farmers' performance and upgrading in general.

CHAPTER FOUR

DETERMINANTS OF EFFICIENCY AMONG SUGARCANE PRODUCERS UNDER CONTRACT: A STOCHASTIC PROFIT FRONTIER APPROACH

4.1 Introduction

This chapter is focused on achieving specific objective two of this thesis. The objective's aim was to determine whether outgrowers' efficiency was influenced by contract farming arrangements in the study areas. The main questions addressed were: "have smallholder farmers grown their sugarcane efficiently? What factors affected efficiency of smallholder cane growers?" The main assumption that governed this study was that the use of contracts in agricultural production tends to influence efficiency of smallholder farmers involved in the contractual arrangements. In responding to this question, we have organised this chapter as follows: Section 4.2 provides brief background information on contract farming and sugar sector in Tanzania. Section 4.3 presents theoretical literature which covers subsections exploring definitions of concepts and theoretical measurement techniques of efficiency. Section 4.4 covers theoretical and empirical reviews on contracts and efficiency, while section 4.5 explores research methods adopted by this study and covers area of study, study sample, units of analysis, econometric model and measurement of variables. Section 4.6 presents the findings of study, both descriptive statistics and ML model estimates. Section 4.7 covers discussion of the findings, and section 4.8 concludes. Section 4.9 explains the policy issues and recommendations.

4.2 Background information on contract farming and sugar sector in Tanzania

Tanzania is among countries that value sugarcane as one of the potential crops for poverty reduction among smallholder farmers. Following this recognition, several initiatives such as Southern Agricultural Growth Corridor of Tanzania (SAGCOT) and CF arrangements were recently introduced to promote production and productivity of sugarcane. CF was promoted in the sector because it is theoretically applauded as appropriate vehicle for transforming small scale subsistence production to market oriented commercial production. It is argued that CF arrangement links smallholder

farmers to the rewarding markets and solves a number of problems smallholder farmers face in their production process. For instance, it helps smallholder farmers raise their productivity, incomes, and promotes favourable investment climate (Minot, 2007; Oya, 2012; Prowse, 2012). Similarly, Minot (2007) argues that CF provides farmers with technical assistance, seeds, fertilizer, and other inputs on credit and guarantee market for the output. However, CF arrangement may also have detrimental effects on smallholders' performance. Opponents of CF for instance argue that, there exists power imbalance between buyers and smallholder farmers leading to an agreement that favors buyers on the expenses of smallholder producers (Bijman, 2008). Likewise, CF involves large buyers who are financially giant agribusiness firms who may dictate the negotiation dialogue and use such powers to exploit smallholder farmers (Key & Runsten, 1999). Therefore, CF has two embedded outcomes likely to happen in due course of its implementation, "success" and "failure". Thus, considering CF as a potential tool for improving smallholder farmers' performance is still an on-going debate.

CF arrangement in Tanzania, particularly in sugarcane production was first practiced in the study area in 2006. Thus far, sugar production has not responded sufficiently to meet the increased domestic demand. Currently, Tanzania is experiencing sugar supply gap exceeding 300,000 tons per year, and the gap is growing at 6% per year (SAGCOT, 2012; Rabobank, 2013). Likewise, the supply gap in neighboring East Africa Community countries (with population of about 130 million) according to SAGCOT is around 550,000 tons per year and the gap is growing at 10+% per year. Such gaps in sugar supply, both existing and projected is a reflection of a regressive cane-productivity at farm level not only in Tanzania but also in the region. Nkonya and Barrior-Hurle (2012) reported that in the period between 2005 and 2010 cane production experienced an increase of about 17%, but, during the same period the area under cane (hectares) increased to about 15%. This means that the observed increase in production was merely a result of an extension in hectares of land. In other words, low productivity recorded in sugarcane subsector is an image of low level of technical, allocative, and economic efficiencies. In which the consequences has been low level of sugar production leading to the persistent sugar deficit in the country, triggering Tanzania to become net importer

of sugar, importing on average 64% of domestic consumption (Nkonya & Barriior-Hurle, 2012; Rabobank, 2013).

The failure of sugarcane producers in Tanzania to meet domestic demand for raw sugar raises a number of key questions to both policy makers and among researchers. One may need to know for example, what are the factors for domestic sugarcane production to lag behind, leading to sugar deficit in the country? This question raises two additional sub-questions. First, have smallholder farmers grown their sugarcane efficiently with the available technology? Second, *why*? The fundamental explanation to this question, as explained earlier, can be associated with the issues of efficiency of cane growers in the usage of resources as a result of engaging in CF arrangements. Therefore, efforts must be undertaken to examine the efficiency levels of sugarcane outgrowers in the study areas and determine the factors behind. As explained earlier knowing efficiency levels is important because efficiency scores provide a signal about smallholder farmers' competence. Moreover, the cumulative efficiency score tells the extent to which smallholder farmers can efficiently use their inputs, which is an important performance indicator for the future prospects of the sector (Cechura, 2010).

Given the importance of efficiency to farmers, this study intended to determine farm level profit efficiency in sugarcane production in Kilombero and Turiani using stochastic profit frontier function. Based on our knowledge, previous studies were available on measuring efficiency of cane growers in the study area and have been confined to functional form for econometric analysis. Their focus has been on measuring technical efficiency only using traditional production function which has been criticised by neglecting other inefficiencies attributed by product quality (Lau & Yotopoulos, 1971). No attention has been given to measuring profit efficiency because the application of stochastic profit frontier function in estimating efficiencies has rarely been tackled. Likewise, there exists very few and probably none of the studies that have attempted to investigate the influence of contract farming on profit efficiency in the study areas. Emphasis by the previous studies has been on ecology, processing facilities, and technologies as driving factors to productivity (see for example Tarimo & Takamura, 1998; URT, 2004; Msuya & Ashimongo, 2005; Fernandez & Nutball, 2009). Thus, this

study intends to bridge the existing gap by determining the role of contract farming on profit efficiency among smallholder farmers in Kilombero and Turiani using a stochastic profit frontier approach. Specifically, in addressing the above mentioned questions the study undertook the following specific objectives: (i) to determine and compare the levels of profit efficiency of smallholder cane-growers under contract between Turiani and Kilombero; (ii) to identify the factors that determine the profit efficiency of the outgrowers by examining whether the inefficiency effects are significantly accountable for efficiency variation among smallholder cane growers in the study area.

4.3 Theoretical literature

This section presents and discusses definitions of major concepts: production and efficiency; techniques of efficiency measurement; theoretical and empirical literature on contracts and efficiency.

4.3.1 Definitions of major concepts

4.3.1.1 Production

Production is the transformation of input into output. It is a complex process which requires a combination of resources in order to generate the desired output. In the agricultural context resources vital for production to take place include but not limited to natural resources, human resources, and physical resources (Ellis, 2003). However, it is theoretically known that the aim of any production unit is to maximise profit given levels of scarce resources and technology. Therefore, in order to transform optimally resources into output, these meager resources must be mobilised for them to be fully utilised otherwise they can be misused and/ or misallocated. The mobilising mechanism is the institutional framework which include though not limited to formal rules, regulations, and contracts. Therefore, the combination of resources and institutions predicts high productivity and profitability of a firm.

This study considers contract farming as one of the formal institutional arrangements potential for driving incentives for sugarcane outgrowers to increase efforts and other resources they own towards sugarcane intensification. This proposition is not limited to

sugarcane cultivation. The role of contract farming in enhancing agricultural performance has been advocated worldwide and the increased use of contracts in international economic activities is evident through the growing number of complex contractual arrangements replacing spot markets (Jia & Huang, 2011). As already explained in chapter two, literature on CF highlights three types of CF arrangements, namely resource provision, production management, and market specification contracts. Through these forms of contractual arrangement, a number of opportunities potential for increased efficiency in production are availed to producers who are engaged in such arrangements. Some of the opportunities discussed in chapter two include provision of inputs such as high quality seeds, agrochemicals, fertilizers, credit, and extension services. Others include access to remunerative markets for the produce. These opportunities create capacity to producers to produce efficiently and offer farmers with incentives to actively participate in the production process. CF is therefore linked with production efficiency theoretically and empirically in section 4.2.2, and the subsection following bellow elucidates the concept of efficiency, followed by efficiency measurement technics.

4.3.1.2 The concept of efficiency

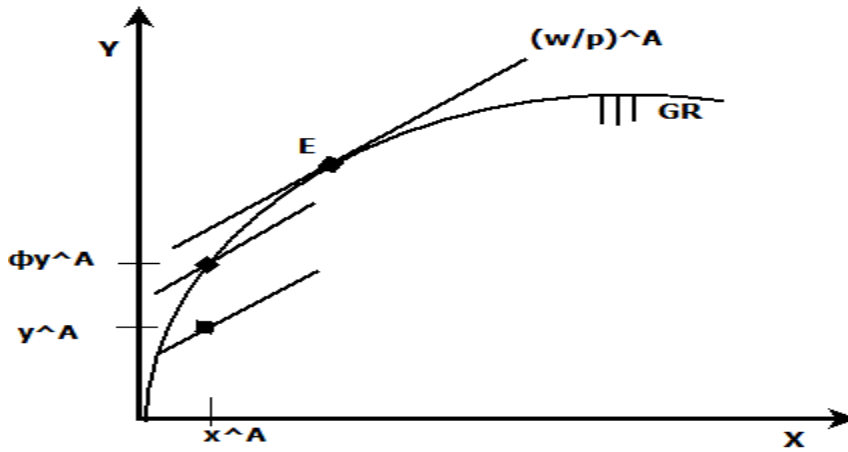
Efficiency has been defined differently depending on the particular discipline and focus. Economists, Business Managers, Administrators, and Industrial Engineers define efficiency base on how their disciplines perceive it. In general, efficiency can be defined as the ability to produce optimal output at minimal cost (Farrell, 1957). According to Farrell efficiency can be categorised as economic, allocative, or technical.

Economic efficiency is a product of allocative and technical efficiencies. A farmer can achieve economic efficiency if and only if he/she has achieved both allocative and technical efficiencies. Thus, allocative and technical efficiencies are preconditions for achieving economic efficiency (Tijani, Alimi, & Adesiyani, 2006). Whereas, allocative efficiency is concerned with input application up to the level that gives output-maximizing profit or the use of input at minimum cost with optimal quantity of output. According to Sarris *et al.* (2006), allocative efficiency determines whether the factors of production are used in proportions that ensure maximum output given the price of output

and inputs. Alternatively, allocative efficiency is achieved when marginal product of a factor input is approximately equal to the marginal factor cost, under the assumption that price of inputs is determined by market forces.

Technical efficiency on the other hand measures the actual production within the existing technology (Idiong, 2007). It is defined as the ability to achieve a higher level of output given similar levels of input (Tijani *et al.*, 2006). Technical efficiency concept can be well explained using the traditional production possibility frontier (PF). This sets a boundary through which a producer is technically efficient if he/she produces along the frontier given levels of input used. Based on the elementary theory of production, technical efficiency is conceptualised as a completely non-wasteful input-output combination and according to Kumbhakar and Lovell (2000: 26), production frontier is further defined as a function $f(x) = \max\{y: y \in P(x) = \max\{y: x \in L(y)\}$, where $f(x)$ describes the maximum output that can be produced with a given vector of inputs; $P(x)$ represents output sets; and $L(y)$ represents the input sets. The input set $L(y)$ consists of all input vectors $x = (x_1, \dots, x_n \in R_+^N$ capable of producing at least scalar output y . The information given above can also be used to explain technical efficiency graphically. Technical, allocative, and economic efficiencies can be explored using profit frontier function (see Figure 4.1).

Figure 4.1: Profit frontier function



Source: Kumbhakar and Lovell (2000: 58)

Figure 4.1 depicts three different points: (x^A, y^A) ; $(x^A, \phi y^A)$; and E in which producer whose motive is to maximise profit $(P^T y - w^T x)$ given output prices $P \in R_{++}^M$ and input prices $w \in R_+^N$ can produce output maximising profit $y \in R_+^M$ using input $x \in R_+^N$. At point E producer facing output and input prices achieves profit efficiency $(\pi E) = 1$, when actual profit equals to the maximum profit. Any other point on Figure 4.1 experiences $\pi E < 1$ for all feasible output–input combinations. For instance, a producer producing output y^A using input x^A at point (x^A, y^A) is both technical and allocative inefficiency. And consider the producer who used the same level of input x^A and increases the output outwardly to ϕy^A could achieve technical efficiency, profit and profit efficiency but would still experience input allocative inefficiency.

Thus, profit frontier serves as a standard in which to measure the performance of the producer by providing the upper boundary in which an individual producer can be located. At the upper boundary like point E on Figure 4.1 producer achieves both technical and allocative efficiencies. Hence, those studies which use production frontier (PF) usually their focal point is to determine technical efficiency only, which fails to capture an individual producer inefficiencies associated with other factor endowments and different input and output prices across farms (Kumbhar & Rovell, 2000).

When these factor endowments are taken into consideration, the output maximising profit could be located and then both technical and allocative efficiencies are realised

and the total factor productivity (TFP) or residual is zero. At this point technical efficiency (TE) equals to one ($TE = 1$), algebraically, a production frontier that incorporates producer specific random shocks can be written as:

$$y_i = f(x_i; \beta) \cdot \exp\{v_i\} \cdot TE \quad 4.1$$

Where; y_i represents output of producer $i, i = 1, \dots, n$, x_i is a set of inputs used to produce a single output (y_i), β represents parameters to be estimated, $f(\cdot)$ is a deterministic production frontier, $\exp\{v_i\}$ is a stochastic component which captures the effect of random shocks of an individual producer, and TE is the output oriented technical efficiency of an individual producer (Kumbhakar & Lovell, 2000).

Equation 4.1 can be re-written as:

$$TE_i = \frac{y_i}{f(x_i; \beta) \cdot \exp\{v_i\}}; \text{ Where: } y_i = f(x_i; \beta) \cdot \exp\{\varepsilon_i\}$$

$$TE_i = \frac{f(x_i; \beta) \cdot \exp\{\varepsilon_i\}}{f(x_i; \beta) \cdot \exp\{v_i\}}, \text{ for } \varepsilon_i = v_i - u_i$$

$$= \exp\{-u_i\} \quad 4.2$$

It implies that technical efficiency is a ratio of observed output to maximum feasible output in an environment characterised with random shocks. When $TE_i = 1$, then $y_i = f(\cdot) \cdot \exp\{\cdot\}$ means that the observed output is equal to the frontier output, and the smallholder farmer is therefore technically efficient. If otherwise $TE_i < 1$ would indicate that the smallholder farmer is technically inefficient and the production lies beneath PF, thus describing a shortfall of observed output from maximum feasible output.

Unfortunately, production frontier works under assumption that inputs are exogenous and independent of technical efficiency. This assumption is considered strong by Kumbhakar and Rovell (2000) due to the fact that most efficient producers tend to produce more through increased inputs use, and thus, there exists correlation between technical efficiency and inputs. Under such instance where production yield increases

with input use, Kumbhar and Lovell (2000) argue that the estimated parameters are inconsistent.

To relax this problem, correlation is allowed between inputs and technical inefficiency by treating variable inputs as endogenous. If the objective of the producer is to maximise profit, correlation between inputs and technical inefficiency can be allowed by estimating technical efficiency using the concept of profit efficiency instead of traditional efficiency specified in equation 4.1. Profit efficiency frontier, under single-output framework is a wider concept used to show the maximum excess revenue over variable cost. It can be classified as standard (conventional) profit function or alternative profit function. The conventional profit function assumes that producers have no influence over output and input prices; they take prices as given (Okoruwa, Akindeinde, & Salimonu, (2009). Given the input (w), output price (p), and fixed input (z), the firm maximises profit by adjusting the amount of inputs and output. Thus, the profit frontier as augmented from Kumbhakar and Lovell (2000) can be expressed in a generalized form as follows:

$$\pi(pwz) = \max_{y,x} [p^T y - w^T x: (yxz) \in GR] \quad 4.3$$

Where: $\pi(pwz)$ represents profit frontier showing maximum net revenue attainable, p is the output prices, w represents variable input prices, y is the output quantities, and z represents fixed input quantities.

When on the other hand, producers have some elements of monopoly power over output price, the alternative profit frontier function proposed by Humphrey and Pulley (1997) can be used instead. The alternative profit frontier was introduced to bridge the gap between a cost frontier and profit frontier. For more details about alternative profit frontier function see for example Kumbhakar and Lovell (2000).

The conventional profit frontier function is adopted for estimation of inefficiency indexes for sugarcane outgrowers. The economic application of the conventional stochastic profit frontier model for production efficiency analysis is explained in the next section.

4.3.1.3 Techniques of efficiency measurement

Efficiency, whether technical or allocative its measurement is subject to the orientation of a particular framework. Efficiency in a cost minimisation framework for instance, is conditional on exogenous output. While efficiency under profit maximisation framework is unconditional, such that more efficient farms produce more outputs with more variable input use. Generally, there are a diverse number of approaches used to estimate efficiency. Their categorisation is based on the type of the technique used, non-parametric or parametric techniques.

Non-parametric technique includes the data envelopment analysis (DEA), while the parametric technique includes the stochastic frontier analysis (SFA). Each of the two methods has its own strengths and weaknesses when used to estimate efficiency. The strengths and weaknesses of each method are not adequately covered under this section, but it is important to figure out the motives behind adapting one method over the other. With all the advantages of DEA, this technique has been criticised by its assumption that any deviation from the production frontier is due to inefficiency. Therefore, any measurement error and /or random stochastic error in the data are confounded with farmer inefficiency (Theriault, 2011).

The SFA technique on the other hand, recognises the presence of random error term in the data. That is, the error term is a composite of two error terms. One error term reflects the inefficiency in production, while the other error term represents random effects outside producer control, e.g. unfavourable climate, measurement error, and other statistical noise (Coelli *et al.*, 1999). Likewise, the current study is a single-output and multiple inputs production analysis, SFA would be an appropriate approach, as opposed to DEA which suits the analysis of production having multiple outputs and inputs.

As explained earlier, the current study adopts SFA to analyse efficiency using profit function instead of production function as it has been criticised by Lau and Yotopoulos (1971) for its failure to capture inefficiencies associated with different factor endowment among farms, and different input and output prices facing farmers attributed by variation in product quality. Under such situation the farms may reveal different production

functions and operate at different optimal points (Rahman, 2003). Due to this shortfall, Lau and Yotopoulos (1971); Yotopoulos and Lau (1973) popularised the use of the profit function in which farm specific prices and levels of fixed factors are incorporated in the analysis of efficiency. Additionally, using profit function according to these authors, input and output prices are treated as exogenous to farm household decision making, and can be used to explain input use.

A number of studies have used stochastic profit function to examine efficiency, namely Adesina and Djato (1996) for rice farmers in Cote d'Ivoire; Beger and Mester (1997) for banking in the US; Maudos, Pastor, Perez, and Quesada (2002) for European banks; Rahman (2003); Kolawole (2006); Okuruwa, Akindeinde, and Salimonu (2009) for small scale rice farmers in Bangladeshi and Nigeria; Tsue and Ayuba (2012) for catfish farmers in Nigeria. However, there is no similar study in sugar sector in Tanzania. The current study has adopted Rahman (2003) modeling strategy, where stochastic profit efficiency frontier model is done in three steps, but estimation is a single-stage procedure. The first model is stochastic profit frontier function, second is an inefficiency model and third is the combination of the first and second models estimated concurrently.

Borrowing from Rahman (2003), the augmented output oriented stochastic profit frontier function is presented as follows:

$$\pi_i = f(P_i, Z_i) \cdot \exp(\varepsilon_i) \quad 4.4$$

Where π_i represents normalised profit of the i^{th} farm defined as gross revenue less variable cost, divided by farm-specific output price; P_i is the vector of variable input prices faced by the i^{th} farm divided by output price; Z_i is the vector of fixed factor of the i^{th} farm; ε_i is an error term; and $i = 1, \dots, n$ is the number of farms in the sample. The composition and distributional assumption of error term ε_i according to Ali and Flinn (1989); Rahman (2003) behave in a manner consistent with the traditional frontier concept introduced under equation 4.1 above, that is,

$$\varepsilon_i = v_i - u_i \quad 4.5$$

Where: ε_i is a composite of two error terms (v_i & u_i); v_i denotes a random variable assumed to be independently and identically distributed as $N(0, \sigma_v^2)$; and u_i is the inefficiency component to be estimated, and is assumed to be distributed independently of v_i to satisfy $u_i \geq 0$ and is derived from a $N^+(0, \sigma_u^2)$ half normal distribution. A higher value of u_i means an increase in the producer inefficiency, and when its value is zero implies that there is perfect efficiency (Theriault, 2011).

Under the distributional assumptions of normal-half normal model of the error component and for equation (4.4) to guarantee that all observations either lie on or beneath the stochastic profit frontier, augmented Rahman (2003) profit efficiency of farm i in the context of stochastic frontier profit function is defined as:

$$PE_i = E\{\exp(-u_i)/\varepsilon_i\} = E[\exp(-\delta_0 - \sum_{d=1}^D \delta_d W_{di})/\varepsilon_i] \quad 4.6$$

Where E is the expectation operator, and through ML method the unknown variance parameters of σ and λ from σ_u^2 and σ_v^2 are conveniently re-parameterised. According to Kumbhakar and Lovell (2000) λ provides an indication of the relative contributions of u and v to ε . Thus the likelihood function is expressed in terms of variance parameters $\sigma^2 = \sigma_u^2 + \sigma_v^2 \leftrightarrow \sigma = (\sigma_u^2 + \sigma_v^2)^{1/2}$ and $\lambda = \frac{\sigma_u}{\sigma_v}$ (Kumbhakar & Lovell, 2000).

As $\lambda \rightarrow 0$ either $\sigma_v^2 \rightarrow \infty$ or $\sigma_u^2 \rightarrow 0$ and therefore, random error component dominates inefficiency error component (u). Otherwise, $\lambda \rightarrow \infty$ either $\sigma_v^2 \rightarrow 0$ or $\sigma_u^2 \rightarrow \infty$ implying that the inefficiency error component dominates the random error term (v).

The inefficiency component that captures random variables associated with inefficiency in production which are assumed to be independently distributed as non-negative half normal is expressed as follows:

$$u_i = \delta_0 + \sum_d \delta_d W_{di} \quad 4.7$$

Where W_d represents the d^{th} explanatory variable associated with inefficiencies on farm i , σ_0 and σ_d the vectors of unknown parameters to be estimated. The distribution assumptions regarding u_i have been specified differently in the literature, however the assumption of non-negative half-normal as specified by Battese and Coelli (1995) was adopted. The choice of this distribution assumption is based on the facts narrated by

Kumbhakar and Lovell (2000); Ritter and Simar (1997) in their paper “pitfalls of normal-gamma stochastic frontier models” that half-normal is relatively simple distribution and relatively easy to derive the distribution of the sum of v and u under distributional assumptions: $v_i \sim iid N(0, \sigma_v^2)$; and $u_i \sim iid N^+(0, \sigma_u^2)$ as compared to other distributions such as truncated or gamma. In the third step, equation (4.6) is added to equation (4.4) in order to estimate concurrently all the unknown parameters of the profit frontier and inefficiency using maximum likelihood method.

4.3.2 Contract farming and efficiency

The influence of contracts on efficiency is theoretically and empirically established via contract terms as revealed from various studies. Theoretically, the most common terms of the contract in agricultural production according to Bijman (2008) include assured markets; access to credit; provision of input such fertilizer, herbicides; and dispute provisions.

Assured market has two major components of market arrangements, pricing mechanisms and payment modalities. Farmers who have access to market and are satisfied by either pricing mechanisms, payment modalities or both have the incentive in profit maximising activities compared to those who either do not have access to remunerative markets or not satisfied by market arrangements. Remunerative markets imply better prices to farmers, which normally motivates them to spend more time and efforts towards production and management of the contracted crop. If the farmer is not sure of the expected price he/she could withdraw efforts and engage him/her-self in other income generating activities. Elliott and McGregor (1999) argue that whether or not individuals work and for how long they work depend on the real wage rates they expect to earn. According to these authors real wage is considered as a motivating package that makes an individual willing to work with a firm although dislikes the type of work. Williamson (1996) had similar conclusion that workers proportionately tend to withdraw efforts as their actual wage falls short. Thus, if a farmer has resources vital for production process to take place, he/she may decide to figure out the market of the produce before commits such resources. Therefore, stable predetermined remunerative price and payment system in the contracts may determine labour allocation decision. Likewise, payment on time

increases incentive for higher participation in crop production, while delay payment may deter small scale farmers from participating in the contracted activities or may become reluctant to commit themselves and their meager resources fully in the activities of the contracted crop. Delay in payments affects other economic activities which depend on cash flow from the contracted crop (Jacobson, 2010).

Theoretically, CF facilitates access to credit. Credit accessibility in agricultural production has been considered vital because it is a basis for obtaining agro-inputs such as hybrid seeds, fertilizers, chemicals, and machinery which are the basis for productivity. Without credit support such inputs could be difficult for marginal farmers to obtain because they are very expensive relative to small farmers' income. Otherwise, marginal farmers could decide to engage themselves in borrowing from informal credit providers who usually charge very high interest rates (Dawes *et al*, 2009). Access to formal credit is often very difficult and sometimes costly for small farmers because majority lack collateral. Sometimes when collateral does not restrict access to formal credit, transaction costs associated with acquiring bank loans may also act as a barrier for farmers to borrow from banks (Swain, 2008). Access to credit therefore, mitigates risks and uncertainties of accessing potential agricultural inputs and farmers are expected to increase production.

CF arrangement by itself forms an institutional framework in which rules and regulations governing farming operations are created, which may offer an enabling environment for either efficiency or inefficiency production to occur. For instance, when the contract is breached and the enforcement mechanism is weak, probably due to the litigation process or lack of government intervention, and especially when the litigation process is very long and costly the affected party may not afford to file a case to court. In this case it may result in more default rate and side selling of small farmers (Kikulunga, 2005). Ultimately this default gives rise to the reluctance of processors to enter into contract farming arrangements. Likewise, this could affect the payoffs of the farmers and may decide to withdraw from the contract as well or again do side selling during next farming season. This may lead to inefficiency in production.

Contract farming arrangement is associated with a risk of gender biasness. Women are less likely to be involved in contract farming scheme. A study carried out by Norsida (2007) reveals that the number of women who participate in agriculture and in contract farming in particular is very discouraging. D'Silva *et al.* (2009) discovered that countries such as Bangladesh, Pakistan, and Afghanistan are women restricting countries for their movement in the public domain. And in countries like Kenya contracts are given to male farmers with the understanding that male household heads can mobilise the labour of women in the family. Men often sign the contracts and receive the payments. Meanwhile, social norms in some ethnic cultures in Tanzania restrict women from being entitled to land and land inheritances from their ancestors, even though their main rural occupation is agriculture. This study included a dummy variable for gender, assigned the value of one if the sugarcane outgrower was male, and zero if otherwise.

Contract farming arrangement is affected by the problem of opportunistic behaviour among the parties involved in the transaction. Opportunistic behaviour includes intentionally designed cheating, misleading, distorting, disguise, deception and confusion for self-interest seeking (Prowse, 2012). The opportunistic behaviour can be manipulated within the terms of contract. To relax this, parties should have enough education and or experiences regarding contracts. Unfortunately agricultural activities in developing countries do not attract educated individuals to engage in. Empirical evidence demonstrate that those with higher education especially university graduates do not get actively involved in agriculture because they have alternative opportunities (McLarty, 2005). Bahaman *et al.* (2008); Md. Salleh *et al.* (2009); Hayrol *et al.* (2009) revealed that agriculture is among the main choice for those with lower education group. A grower of similar characteristics cannot get out of the contract once entered even though the expected benefits do not happen due to low price, crop failure, and or crop rejection.

Other empirical literature has realised that farmers' characteristics such as age, experience, and household size are positively related to efficiency (Rahman, 2003; Okoruwa *et al.*, 2009; Kolawole, 2006). Similarly, other household income generating activities have influence on efficiency. For instance, taking part in the off-farm activities

may restrict specialisation in crop production since time for crop cultivation would be split off, thereby increasing inefficiency (Rahman, 2003). On the other hand, participation in off-farm activities increases financial liquidity and thus enabling farmers to obtain necessary inputs for crop production, thereby decreasing inefficiency (Kolawole, 2006).

The effect of these factors on farm's efficiency has implication to the household's livelihood strategies. Households with inefficiency farms may decide to diversify more in nonfarm activities compared to efficient farmers, thereby drawing a policy concern for poverty reduction. This is due to the fact that diversification practice is a norm for the majority of the developing economy's households. Countries, such as Malawi, Bangladesh, Nepal, Tajikistan, Nicaragua, Guatemala, Ecuador, and Panama, more than one in three rural households participate in nonfarm activities due to risks associated with farm activities (Winters *et al.*, 2009).

4.4 Research methodology

This section covers various issues mainly are the description of the study areas, description of sample size, and data collection techniques, including empirical model used to estimate profit function.

4.4.1 Study area, sample size, and data collection

The current study used primary data collected through an intensive farm-survey of sugarcane producers conducted during July-August 2012 in two areas of Tanzania, i.e. Kilombero and Turiani. The detailed information on how data were collected including methods of data collection and reasons for selecting the study areas is referred back to chapter two. As explained earlier on, using multistage sampling techniques, a total of 400 sugarcane outgrowers were selected from both locations, where 200 were from Kilombero and the other 200 from Turiani. The sample size from each location was obtained by selecting farmers who grow sugarcane randomly.

Using a structured questionnaire administered in the sampled farmers, data related to yields, unit cost of labour (total labour expenditure per farm include the imputed cost of

family labour at the wage rate paid to hired labour), land area under sugarcane cultivation (acre), input prices such as price per kilogram of fertilizer and price per liter of herbicides. Other information collected includes perception of cane growers on market satisfaction (a proxy for CF arrangement) where pricing and payment mechanisms were included in evaluating market satisfaction. Information on socio-economic variables such as age, education, household size (dependents and workforce), and farming experience were also collected. However, data were only available for the major inputs such as land, labour, and fertilizer. Information on other inputs potential for sugarcane production such as seeds, pesticides, and farm capital assets was not used in the analysis. It was realised that all respondents were serving ratoon crops that is, they had no new crops, and thus seed data was not available for the survey-year. Similarly, ratoon crop requires weeding only, and the majority used to do weeding by traditional hand hoes, and also no land preparation was required, consequently farm capital assets were not important. Likewise, very few less than 5% applied herbicides, thus, this variable was omitted since majority had many zero values on this variable.

4.4.2 Empirical model

There are a number of functional forms that exist in literature for profit function estimation. Some of these functions include Cobb Douglas, Translog, generalised quadratic, and generalised Leontief. Remarkable studies had employed either of the functional forms presented above, for instance Cobb Douglas (Lau & Yotopoulos, 1971; Yotopoulos & Lau, 1973; Kumbhakar, 1987; Kumbhakar, Biswas, & Bailey, 1987; Kolawole, 2006; Okoruwa, Akindeinde, & Salimonu, 2009). The alternative to Cobb Douglas production function is Translog production function. Studies that employed Translog model have also reported measures taken against multicollinearity problem, which is the main weakness of the Translog model (Atkinson & Halvorsen, 1980; Kumbhakar & Bhattacharyya, 1992; Kumbhakar, 1994, 1996). Likewise, the presence of interaction terms in the Translog model raises concern on the potential problems of insufficient degree of freedom. In addition, the interaction terms have also been criticised for lacking economic meaning (Okoruwa *et al.*, 2009).

Despite its weaknesses, this study has adopted Cobb Douglas production function due to its popularity. It is frequently used to estimate farm efficiency due to its advantages in computation and interpretation (Manjunatha, Anik, Speelman, & Nuppenau, 2013). The main weakness of the Cobb Douglas production function is that it imposes a severe prior restriction on farm's technology by limiting the production elasticities to being constant and the elasticities of substitution to unit (Manjunatha et al., 2013). However, our dataset allows us to test the Translog model, since our sample size is larger enough to enable estimation of the additional number of coefficients resulted from interaction variables.

The current study applied stochastic frontier profit function and inefficiency model to scrutinise the influence of land ownership, fertilizer usage, labour, and market satisfaction on profit and efficiency of sugarcane farms in Kilombero and Turiani. The inefficiency model is derived from the error component of the stochastic frontier model. In this model we included different variables that assumed to have direct influence on farm efficiency but indirectly on profit. The general form of the Cobb Douglas stochastic profit frontier function that specifies production efficiency of the farms is expressed as follows:

$$\ln\pi = \beta_0 + \sum_{i=1}^3 \beta_i \ln P_i \ln Z_i + v_i - u_i \quad 4.8$$

Equation (4.8) was employed in the analysis and expanded as shown below by including variables that were analysed in the regression using maximum likelihood technique. However, due to “zero observations problem” to some of the variables such as fertilizer, this study has modified Cobb-Douglas to permit those explanatory variables that have zero values to be estimated without generating biased estimators. Battese (1996, 1997) argues that such modification is considered appropriate method for estimating data on farmers who may not have used such variable(s) but which are common to all farmers. Therefore, efficiency associated with fertilizer variable was embedded with a dummy equal to one if price of fertilizer (FERT) was zero⁴, and zero if the price of FERT variable was positive. See Battese (1996, 1997) for more detailed specification.

⁴ Price of fertilizer is zero if farmer did not apply fertilizer at all, and the price is positive implying that the farmer applied at least fertilizer.

Therefore, equation (4.8) can be re-written as follows:

$$\ln\pi = \beta_0 + \beta_1 \ln DFERT + \beta_2 \ln[\max(P_{fert}, DFERT)] + \beta_3 \ln P_{labor} + \beta_4 \ln Z_{land} + v - u \quad (4.9)$$

Where: \ln represents Logarithms to base e ; π is restricted profit (total revenue less total cost of variable inputs) normalised by output price; DFERT represents dummy for fertilizer, DFERT = 1 if cost of fertilizer is zero, and DFERT = 0 if cost of fertilizer is greater than zero; P_{fert} is the price of fertilizer normalised by output price (the price of fertilizer is total expenditure on fertilizer kilogram including application cost); P_{labor} is the price of labour normalised by output price (normalised labour cost per farm i.e. cost of hired labour plus the cost of family labour used in production calculated using the wage rate paid to hired labour); Z_{land} is the quantity of fixed input (land) used in sugarcane cultivation measured in acres. Whereas β_0, \dots, β_4 are unknown parameters to be estimated. v_i and u_i are stochastic random error and inefficiency component, respectively. The expression $\ln[\max(P_{fert}, DFERT)]$ accounts for zero usage of fertilizer by individual farmer. On the other hand DFERT accounts for intercept change, without which elasticity's estimator for profit maximising output to fertilizer could be bias (Battese, 1996; Onumah et al., 2009). Labour and fertilizer are treated as variable inputs of production and land as fixed input.

Some farmers' characteristics and institutional factors were also incorporated into the frontier model as they were suspected to have a direct influence on efficiency. Thus, the model specification to investigate sources of inefficiency at farm level (equation 4.7) was expanded to include socio-economic and institutional variables to form equation (4.10) which was analysed in the regression.

$$u_i = \delta_0 + \sum_{i=1}^{11} \delta_i W_i \quad 4.10$$

Where, W_i is the i^{th} variable representing farm characteristics and institutions to explain inefficiency, and $i = 1, \dots, 11$. Thus: W_1 is age of the household head in years; W_2 represents no formal education attained by the household head; W_3 represents primary education attained by household head; W_4 represents secondary education attained by the head of the household; W_5 stands for post-secondary education attained by a farmer;

W_6 is a dummy variable for gender, 1= male, 0 otherwise; W_7 is a dummy variable for ownership of non-agricultural assets, 1 = Yes, 0 otherwise; W_8 represents the perception dummy variable for market satisfaction, 1= Yes, 0 otherwise; W_9 is non-sugarcane income share, expressed as a ratio of income from diversified activities to the total household income. Other inefficiency variables include W_{10} , a dependent ratio (number of dependent age group members to the total number of household members); and W_{11} representing diversification dummy, having value of one if a farmer diversifies, zero otherwise, $\delta_1, \dots, \delta_n$ for $n=11$ are the inefficiency parameters to be estimated

Before estimation of profit efficiency and inefficiency from equations 4.9 and 4.10, data are checked to verify whether they adequately represent the Cobb Douglas functional form, and also whether the inefficiency effects (u) fulfills specified distributional properties. The operationalisation of the specific model functional form and the distributional assumptions are tested by the following hypotheses:

1. The null hypothesis that the model used is represented adequately by the appropriate functional form is tested. This helps to specify which one among the most widely used functional forms of the stochastic frontier method between Cobb-Douglas and Translog is appropriate.

2. The null hypothesis that there is full efficiency at all levels in the model:

$H_0: \lambda = \delta_0 = \delta_1 = \dots \delta_7 = 0$. This helps to show the appropriateness of employing stochastic frontier model over ordinary least squares. The test also helped to achieve the first specific objective of this study i.e. to determine levels of profit efficiency of the smallholder cane growers, and whether in the study areas the smallholder cane growers were economically efficient.

3. The null hypothesis that the observed variations in profits are due to random effects $H_0: \lambda = 0$. This helps to show the dominance of inefficiency component compared to random effect on profit variation.

4. The null hypothesis that farm's characteristics and other institutional factors jointly do not influence farm's inefficiency ($H_0: \lambda = \delta_1 = \dots \delta_7 = 0$). This helped to achieve the second objective of this study i.e. whether in the study areas the

inefficiency effects were significantly accountable for efficiency variation among smallholder cane growers or not.

5. Another hypothesis of interest from equation (4.8) is the null hypothesis that there is no intercept change: $H_0: \beta_1 = 0$. This helps to check whether the zero observations to fertilizer variable have effects on the parameter estimates or not (Battese 1996).

Testing the above hypotheses is performed using generalised likelihood-ratio (LR) test statistic defined by: $\lambda = -2[\ln\{L(H_0)\} - \ln\{L(H_1)\}]$ 3.11

Where: $L(H_0)$ and $L(H_1)$ represents respectively the value of the likelihood function under the null hypothesis (H_0) and the alternative hypothesis (H_1). According to Onumah and Acquah (2010), the null hypothesis is true when the likelihood ratio test has approximately a chi-square or mixed chi-square distribution with a degree of freedom equal to the number of parameters assumed to be zero in the null hypothesis.

4.5 Findings

4.5.1 Descriptive statistics

Summary statistics of the variables used in the analysis appears in Table 4.1, in which the upper section of the Table reports output, profit, prices, and input variables. It shows that the mean output per farm in Kilombero was 72.7 tons of sugarcane per farm and a standard deviation of 108.7 tons per farm. The mean yield in Turiani was 51.5 tons of sugarcane per farm and standard deviation of 44.3 tons per farm. This statistics denotes that there existed large variability of sugarcane yields between Kilombero and Turiani farms. The difference in output between Kilombero and Turiani farms was large and statistically significant at 1% significance level. Meanwhile, the mean profit for Kilombero farms was Tsh. 1,548,530 and a standard deviation of Tsh. 2,421,174 and for Turiani the average was Tsh. 506,721 and a standard deviation of Tsh. 894,536, which implies that there existed an obvious and statistically significant profit difference between Kilombero and Turiani farms at 1% significance level. Likewise, the average price of sugarcane in Kilombero was Tsh. 48,110.90 per ton and the standard deviation was Tsh. 8,676.10 per ton and in Turiani the average was Tsh. 33,012.90 per ton and the

standard deviation was Tsh. 7,893.50 per ton, which shows that there was minor price variation among farms in both areas. The mean fertilizer usage in Kilombero farms was 185.7 kilograms per farm and 82.8 kilograms/ farm in Turiani, whilst the average farm size cultivated with sugarcane in Kilombero was 3.7 acres which is relatively smaller than the average farm size cultivated with sugarcane in Turiani of 5 acres. Differences in sizes of farms in the two areas do not explain farm productivity differences since Kilombero exhibit higher average input usage than Turiani although its farm size was relatively small.

On the other hand, the mean labour wage in Kilombero was Tsh.33, 920.40 per acre, while in Turiani the mean labour wage was Tsh. 30,128.30 per acre. The average labour wages fall below the minimum standard wage rate per acre set at Tsh. 40,000.00, implying that labour is underutilized. It can be concluded that variation in farm profitability between Kilombero and Turiani could be associated with differences in sugarcane yields and prices offered. Higher output per acre in Kilombero was associated with higher input usage both fertilizer and labour as compared to Turiani, although both areas seem to underutilise labour and fertilizer when likened to the benchmarked standard.

The lower section of Table 4.1 reports farm-specific and institutional variables. It indicates that majority (76.7%) of the smallholder cane growers in the study areas had primary school education, while those who had no formal education were 15.5% and those with secondary education and post-secondary education were 6.5% and 1.3%, respectively. Out of these 74.6% were males, implying that sugarcane cultivation was male dominated activity. In aggregate, 70.5% of the smallholder cane growers surveyed were involved in other income generating activities or had a member who participated in other income generating activities. Area specific result on outgrowers' diversification status shows that participation rate was 54.9% in Kilombero, and 85.6% in Turiani. Other variables included were non-agricultural asset ownership, market satisfaction, non-cane income share, and dependents ratio. Majority (84.8%) of smallholder sugarcane farmers owned non-agricultural asset such as TV, bicycles, motor cycles, and fridge in Kilombero, and 95.4% of Turiani cane growers. With regard to market satisfaction, 48.7% of cane growers in Kilombero were satisfied by the market

arrangements and only 8.2% of cane growers in Turiani were satisfied by the market arrangement. Income share from non-sugarcane activities was 26% of total household income and dependents' ratio was 60% of household size in Kilombero. In Turiani 54% of the total out-grower's income was derived from none-sugarcane activities and 60% of household size was dominated by dependents.

Table 4.1: Summary statistics for profit function and inefficiency variables

Variables	Study areas					
	Kilombero (n=191)		Turiani (n=195)		Pooled data (n=360)	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
<i>Output, profit, prices and inputs</i>						
Output (Tons)	72.7	108.7	51.5	44.3	56.95	84.1
Profit (Tsh)	1,548,530	2,421,174	506,721	894,536	1,022,228	1,888,972
Cane price (Tsh/Ton)	48,110.9	8,676.1	33,012.9	7,893.5	40,483.72	11,210.4
Fertilizer (Kg/acre)	185.7	265.8	82.8	108.7	133.7	208.5
Fertilizer price (Tsh/ Kg)	1,030.6	333.9	781.6	564.2	904.8	480.6
Labour wage (Tsh/Acre)	33,920.4	10,804.1	30,128.3	12,441	32,004.7	11,798.4
Land with cane (acre)	3.7	3.6	5	4.2	4.3	3.9
<i>Farm-specific and institutional variables</i>						
Age (years)	46	13.5	53	16.1	49	15.3
No formal education (%)	15.3	0.4	15.9	0.4	15.5	0.4
Primary education (%)	76.4	0.4	76.9	0.4	76.7	0.4
Secondary education (%)	7.3	0.3	5.7	0.2	6.5	0.2
Post-secondary educ. (%)	1.0	0.1	1.5	0.1	1.3	0.1
Gender, (male=1) (%)	76.9	0.4	72.3	0.4	74.6	0.4
Non-agricultural assets (%)	84.8	0.4	95.4	0.2	90.1	0.3
Market satisfaction	48.7	0.5	8.2	0.3	28.2	0.4
Non cane income share	0.26	0.3	0.54	0.3	0.40	0.3
H/Dependent ratio	0.6	0.3	0.6	0.2	0.6	0.3
Diversify (%)	54.9	0.5	85.6	0.3	70.5	0.4
Area (location)	1	0	0	0	0.5	0.5

Source: Derived from POLICOFA survey data (2012).

4.5.2 Profit frontier estimates

Hypotheses testing and variance parameters

Profit frontier results are reported in Table 4.2, and were interpreted first by testing the hypothesis about selection of the appropriate functional form between Cobb Douglas

and Translog stochastic frontier functions. The test for the Translog stochastic frontier function was carried out and the second order and interaction variables were dropped automatically from the analysis due to collinearity problem and the Translog model missed economic meaning except for the Cobb Douglas frontier.

The variance parameters positioned in the middle section of Table 4.2 indicate that the value of the generalized likelihood ratio (LR) test statistic which tests the absence of inefficiency (refer to hypothesis 2 which states that there is no inefficiency effect in farm profit), and that the observed variation in profit is only due to random effect (hypothesis 3), exceeds the mixed chi-squared (χ^2) distribution. The value of LR test statistic in Kilombero was 11.38 with p-value of 0.0000 and for Turiani the LR test statistic was 7.63 with p-value of 0.0000 signposting that both values exceeded the mixed chi-squared. Thus, the null hypotheses 2 and 3 were rejected, implying that there were significant technical and allocative inefficiency effects in farm profit.

Indeed, the result confirmed further that the distributional assumption of half normal of the Cobb Douglas stochastic frontier model, and the good fit and correctness of the specification for maximum likelihood estimation was met. This is verified by the observed magnitude and significance of the estimated value of $\lambda = 3.1518$ for Kilombero and $\lambda = 1.8739$ for Turiani and their corresponding values of estimated standard deviation of a composite error term $\sigma = 1.1044$ and 1.1164 for Kilombero and Turiani, respectively. These parameters are large enough implying that a larger part of profit variation among farms is explained by the model. Similarly, the estimated value of lambda is greater than one ($\lambda > 1$), implying that a high level of inefficiencies existed in sugarcane farming.

Table 4.2: Parameter estimates of the stochastic profit frontier and profit inefficiency

Variable	Parameter	Kilombero: n = 191		Turiani: n = 195		Both areas: n = 386	
		Coefficient	z-ratio	Coefficient	z-ratio	Coeff.	z-ratio
<i>Profit function</i>							
Constant	β_0	3.30515	23.13***	3.04130	15.61***	3.0112	19.04***
D_{FERT}	β_1	-0.03933	-0.25	0.00108	0.01	-0.0859	-0.86
$\ln P'_{FERT}$	β_2	0.44498	4.78***	0.17445	1.57	0.31389	4.04***
$\ln P'_{LABOR}$	B_3	0.00493	0.07	0.12924	1.81*	0.07485	1.47
$\ln \text{landwithcc}$	B_4	0.80687	11.91***	0.68515	7.82***	0.70467	12.49***
<i>Variance parameters</i>							
Sigma (v)	σ_v	0.3340		0.5256		0.3533	
Sigma (u)	σ_u	1.0527		0.9850		1.2164	
Sigma sq.	σ^2	1.2198		1.2465		1.6046	
Sigma	σ	1.1044		1.1164		1.2667	
Lambda ($\frac{\sigma_u}{\sigma_v}$)	λ	3.1518		1.8739		3.44 25	
Log-likelihood		-188.131***		-221.45***		-427.7***	
LR – test (1)		11.38***		7.63***		20.11***	
<i>Inefficiency parameters</i>							
Constant	δ_0	-0.7323	-0.41	-2.5380	-1.43	-1.9797	-1.15
Age	δ_1	0.0167	1.57	0.0186	1.73*	0.0169	1.52
Edu1	δ_2	-0.0038	-0.00	0.0764	0.06	0.6935	0.55
Edu2	δ_3	-0.2475	-0.15	0.3468	0.30	0.6732	0.55
Edu3	δ_4	-1.5659	-0.93	-0.1012	-0.08	-0.2422	-0.17
Gender, 1-male	δ_5	0.0015	0.00	-0.6301	-0.18	-0.1579	-0.46
Non-agric-asset	δ_6	-0.1924	-0.52	-0.7821	-1.16	-1.3239	-1.68*
Mkt-satisfy	δ_7	0.3727	1.29	-0.4548	-0.78	0.2167	0.44
Income-share	δ_8	2.1256	2.97***	-0.0076	-0.03	-0.0005	-0.02
Dependent-ratio	δ_9	-0.0866	-0.25	1.2698	1.95*	0.7460	1.40
Part time	δ_{10}	-1.1696	-2.20**	1.2471	2.17***	1.2543	1.67*
Area	δ_{11}					-1.9546	-1.93*

***, **, * implies significant at 1 percent, 5 percent and 10 percent levels respectively

Source: Derived from POLICOFA survey data (2012)

Based on λ estimates it is possible to determine the value of gamma (γ) which measures relative contribution of the inefficiency effect on the total variance of the observed

profit: $\gamma = \lambda^2 / (1 + \lambda^2)$ leading to $\gamma = 0.922$, which means that about 92.2% of the variation between the observed and maximum frontier profits in sugarcane cultivation was due to the existed differences in the levels of technical, allocative and scale inefficiencies rather than random variability. Therefore, the fourth null hypothesis that smallholder farms' characteristics and other institutional factors did not influence farm inefficiency $H_0: \delta_1 = \dots \delta_{11} = 0$ was strongly rejected. Similarly, this also confirmed that the sampled data could not be represented by the ordinary least square (OLS) function.

The other hypothesis of interest was the null hypothesis that there were no intercept changes as result of zero observations on fertilizer variable ($H_0: \beta_1 = 0$) which was not rejected. The intercept coefficient was statistically insignificant different from zero for both Turiani and Kilombero. Means that even without introducing dummy to the fertilizer variable due to its zero values for farmers who did not apply fertilizer, would had resulted in unbiased parameter estimates (Battese, 1996, 1997).

Based on the maximum likelihood estimates (MLE) of the parameters of the Cobb Douglas stochastic frontier profit function presented in Table 2, parameters for input prices and fixed factors are positioned in the upper section. And the estimated coefficients of the parameters of these variables (fertilizer price, labour wage, and farm size) are interpreted as elasticities computed directly from the normalised profit function that aimed at illustrating the pattern of responsiveness of the farmers to farm profits. Coefficients had the expected sign except fertilizer and labour costs. The elasticity estimates of fertilizer cost and farm size were positive and statistically significant at 1% significance level, implying that a unit percent increase in the cost of fertilizer and acreage of land, *ceteris paribus*, would lead to a corresponding increase of sugarcane profit by 0.44% and 0.81%, with farm size seemed to be the most important variable determining profit efficiency. Estimates for wage rate and dummy variable for fertilizer were not statistically significant in Kilombero, but in Turiani price of labour was positive significant at 10% level. The implication is that a unit percent increase in the cost of labour would lead to corresponding increase in farm profit by 0.129% if other factors remain unchanged.

The lower section of Table 4.2 reports inefficiency parameters. The pooled data result of the inefficiency model showed that ownership of non-agricultural asset and location were statistically significant at 10% significance level and negative to profit inefficiency. The coefficient of part-time was positive to profit inefficiency and statistically significant at 10% significance level.

The area specific data result indicated that non-cane income share was positive and statistically significant at 1% significance level in Kilombero, but statistically insignificant in Turiani. Part-time was negative and statistically significant at 5% significance level in Kilombero while in Turiani it was positive and statistically significant at 1%. Age of the sugarcane grower, education level, gender, market satisfaction and household size were not statistically significant at all conventional levels in Kilombero, but age and household size were positive and statistically significant at 10% significance level in Turiani.

4.5.3 Profit efficiency

Profit efficiency scores are reported in Table 4.3, where profit efficiency score by household and institutional characteristics are positioned in the upper section of the Table, and the average, maximum, and minimum profit efficiency scores are placed in the lower section of Table 4.3. Efficiency scores' frequency distribution and location-wise skewness are presented in Figure 4.2.

Table 4.3 reveals that on average, farms operated at a profit efficiency of 0.803 with the efficiency scores ranging between 0.263 and 0.9238 in Kilombero. However, in Turiani the mean profit efficiency was 0.556 with the profit efficiency scores ranging between 0.066 and 0.867. Based on the estimated mean scores, the sugarcane outgrowers were able to obtain 80.3% of their potential profit from given inputs in Kilombero and about 55.6% of their potential profit for the outgrowers in Turiani. This means that about 19.7% and 44.4% of the profit lost in Kilombero and Turiani, respectively due to lack of improvement in technical, allocative and scale inefficiencies. Rahma (2003) reported mean profit efficiency of 0.77 for rice farmers in Bangladesh; Zahidul Islam, Sipilainen, and Sumelius (2011) reported mean profit efficiency of 0.756 for rice farmers who had

access to microfinance in Bangladesh; Adamu and Bakari (2015) reported mean profit efficiency of 0.59 for rice farmers in Northern Taraba State, Nigeria.

Profit efficiency distribution and heterogeneity

Profit efficiency scores by household and institutional characteristics are presented in the upper section of Table 4.3. The result indicated that there was substantial degree of heterogeneity by farm-specific and institutional characteristics. For instance, education which was categorised into four; no formal education, primary education, secondary education and post-secondary education revealed that the mean profit efficiency score was high for households with secondary education (0.8618) followed by post-secondary education (0.8422), primary education (0.8043), and no formal education (0.7633) in Kilombero. Similar pattern was observed in Turiani where profit efficiency scores by education category was recorded as follows: households with secondary education were found with highest mean score of 0.6444, followed by post-secondary education (0.5624), primary education (0.5543) and the lowest score was found among those without formal education (0.5375).

Age-wise, young households with age below 50 years had the highest efficiency scores (0.8134) and (0.5861) for Kilombero and Turiani respectively. The lowest efficiency score (0.7761) for Kilombero was found among the age group of above 65, but for Turiani the lowest score (0.5180) was found among the age group between 51 and 65 years.

Gender-wise, male cane growers experienced higher efficiency score (0.8153) and (0.5705) than female cane growers' score (0.7605) and (0.5211) in Kilombero and Turiani, respectively. And part-time farmers experienced lower efficiency score (0.7737) than fulltime farmers (0.8381) in Kilombero. The pattern was similar in Turiani, where the lower efficiency score (0.5392) was found among part-time farmers than full-time farmers whose efficiency score was 0.6619. Likewise, ownership of non-agricultural assets by sugarcane outgrowers increased profit efficiency scores than those outgrowers who were asset poor. The household dependent ratio variable, on the other hand, indicated that the higher the ratio the lower the profit efficiency (Table 4.3). Implying

that those households with large number of dependent members were less efficiency, which was as per theory expectation.

Area dummies were also included to capture the influence of locational characteristics. The summary statistics of profit efficiency by farm-specific characteristics (Table 4.3) revealed that farms located in Kilombero were more profitable than those located in Turiani. The mean profit efficiency score was 80.3% in Kilombero against 55.6% in Turiani. Similarly, the frequency distribution of farms' efficiency scores by area (Figure 4.2) showed that majority (about 90%) of smallholder cane growers in Kilombero had efficiency scores concentrated in the range of 71% and above. In contrast, it was only 20% of Turiani farmers who attained efficiency scores in the range of 71% and above.

Table 4.3: Summary of profit efficiency by farm-specific and institutional characteristics

Farm-specific and institutional characteristics		Profit efficiency								
		Kilombero			Turiani			Both areas		
		Mean	Std.	n	Mean	Std.	N	Mean	Std.	n
Education	No formal edu.	0.7633	0.123	29	0.5375	0.159	31	0.6466	0.182	60
	Primary edu.	0.8043	0.081	146	0.5543	0.160	150	0.6776	0.178	296
	Secondary edu.	0.8618	0.036	14	0.6444	0.132	11	0.7661	0.141	25
	Post-secondary	0.8422	0.283	2	0.5624	0.125	3	0.6743	0.177	5
Age	≤ 50 years	0.8134	0.084	136	0.5861	0.140	94	0.7205	0.157	230
	51-65 years	0.7762	0.103	36	0.5180	0.179	52	0.6236	0.198	88
	Above 65	0.7761	0.083	19	0.5418	0.161	49	0.6073	0.178	68
Gender	Male	0.8153	0.066	147	0.5705	0.162	141	0.6955	0.173	288
	Female	0.7605	0.133	44	0.5211	0.144	54	0.6286	0.183	98
Mkt-satisfy	Yes	0.8264	0.058	98	0.5666	0.1522	16	0.7467	0.136	109
	No	0.7777	0.107	93	0.5559	0.159	179	0.6516	0.185	277
Assets*	Yes	0.8193	0.661	162	0.5652	0.156	186	0.6835	0.176	348
	No	0.7097	0.134	29	0.3834	0.112	9	0.6325	0.190	38
Part time	Yes	0.7737	0.096	105	0.5392	0.158	167	0.6297	0.178	272
	NO	0.8381	0.643	86	0.6619	0.121	28	0.7948	0.111	114
Dependents	≤ 0.5	0.8126	0.079	105	0.5872	0.141	91	0.7080	0.156	196
	Above 0.5	0.7905	0.106	86	0.5303	0.169	104	0.6480	0.193	190
Income	≤ 0.5 share	0.8248	0.686	126	0.6490	0.139	46	0.7778	0.121	172
	Above 0.5	0.7598	0.107	65	0.5284	0.154	149	0.5987	0.177	214
Area	1=Kilombero	0.8027	0.891	191	0.5568	0.159	195	0.6785	0.178	386
Profit efficiency	Average	0.803	0.891	191	0.556	0.158	195	0.678	0.178	386
	Maximum	0.928		191	0.867		195	0.928		386
	Minimum	0.263		191	0.066		195	0.066		386

*Implies non-agricultural assets

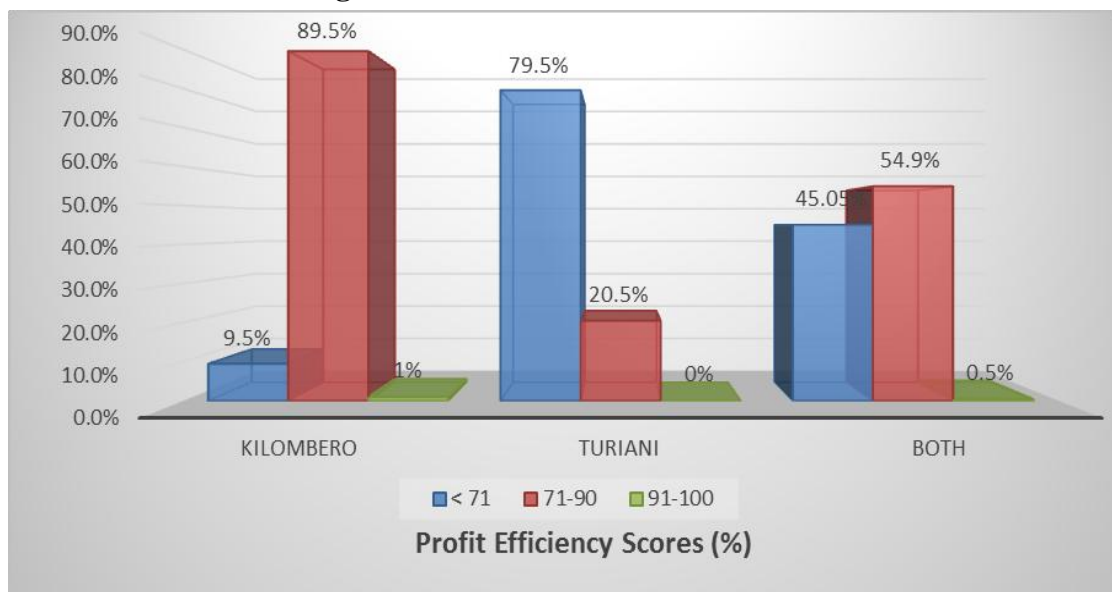
Source: Derived from POLICOFA survey data (2012)

Thus, following this wide variation of profit efficiencies among smallholder sugarcane producers in Kilombero and Turiani warranted the need to identify the determinants of inefficiency estimated from equation 4.10.

Determinants of profit inefficiency

Given the sources of inefficiency listed in the lower section of Table 4.2, and the efficiency estimates for each cane grower in Table 4.3, the next task was to identify determinants of inefficiency. Note that a negative sign on a parameter explained positive impact on efficiency because they were treated as inefficiency variables. The pooled data result showed that ownership of non-agricultural asset and location were negatively and statistically significant at 10% significance level, and part-time was positive and statistically significant at 10% significance level. For Kilombero, non-sugarcane income share was positive and significant at 1% significance level and part-time was negative and significant at 5%. In Turiani, Part-time and dependent ratio were positive and significant at 1% and 10% significance levels, respectively.

Figure 4.2: Profit efficiency scores for smallholder cane growers based on Cobb Douglas function



Source: Derived from POLICOFA survey data (2012)

4.6 Discussion of the findings

The summary statistics indicated that there was large variability of output between smallholder cane growers in Kilombero and Turiani. This variation in sugarcane yields could be associated with the differences in input allocation among farmers and inefficiency reasons. With regard to input allocation, the average farm size cultivated with sugarcane in Kilombero for example, was 3.5 acres, and in Turiani it was 5 acres, which is equivalent to 1.4 hectares for Kilombero and about 2 hectares in Turiani (by relating 1ha = 2.471 acres). The standard UREA fertilizer usage was 225 kilograms/ha according to 2011/12 cane production cost estimates (see appendix I). Thus, for 1.4 ha, a total of 315 kilograms of UREA fertilizer were required to fertilize in Kilombero, and for the average farm size of 2 ha in Turiani, 450 kilograms of UREA fertilizer were supposed to fertilize the farm. Unfortunately, only 183.3 kilograms of fertilizer were used in Kilombero equivalent to 58%, and 84.4 kilograms were used in Turiani which is equivalent to 18.7%. The implication is that both areas underutilized fertilizer on their farms, with Turiani farms exhibiting extremely lower fertilizer underutilisation than their counterparts in Kilombero.

Similarly, the analysis of variable input prices revealed that the average labour cost in Turiani was relatively lower than the average labour cost in Kilombero. This signposted that labour utilisation was at lower rate in Turiani than in Kilombero. The average profit made per farm for the sugarcane harvested in Kilombero was higher than the average profit made in Turiani. The farm's profitability differences between Kilombero and Turiani could be associated with differences in levels of variable input utilisation and sugarcane prices, if other factors are held constant. The mean age of 46 years in Kilombero and 53 years in Turiani indicated that sugarcane growers in the study areas were within the active age group, and Kilombero exhibited younger cane growers than those in Turiani. Educational attainment by sugarcane growers in the study areas was likely to influence their inefficiency levels in sugarcane production. Majority of the sugarcane outgrowers attained primary education and those with no formal education ranked the second, thus, making a total of 92.2% of sugarcane growers who had either primary education or no formal education. Such lower level of education might reflect

lower level of their ability and speed to adopt new technology, hence, likely to influence positively their inefficiency in sugarcane production in terms of quality and quantity.

The analysis of gender in sugarcane production indicated that men comprised 74.6% of the outgrowers sampled in study area. The result suggested that sugarcane cultivation was a male dominated activity. The result on non-agricultural asset variable expressed in percentage showed that 90% of sugarcane growers owned non-agricultural assets. Its influence on profit efficiency is not clear because asset ownership may signpost wealth of an individual, hence, collateral for obtaining loan which can be used to purchase productive agriculture inputs, thus, leading to a positive influence on efficiency. Contrary to this argument is that ownership of nonagricultural assets enables farmers to participate in other income generating activities (Schwarze & Zeller, 2005), hence it limits activity specialisation, leading to inefficiency.

Perception on market satisfaction indicated that majority, 72% of sugarcane growers in aggregate were not satisfied by the market arrangement. This was likely to affect their profit efficiency adversely. Because less satisfaction might lead to low motivation to farmers, and consequently, paying less attention on a particular activity. Elliott and McGregor (1999) had similar finding. Non-sugarcane income share was larger enough to account for about 54% of the total income of the sugarcane outgrower in Turiani. In Kilombero the non-cane income share was only 26% of the overall cane grower's income. This has dual implications, it may imply that outgrowers in Turiani had been concentrating more in non-cane activities, leading to inefficiencies in sugarcane cultivation, or had created enough income from non-cane activities which is used to relax financial constraints, particularly for resource poor farmers and thus enabled them to procure inputs for sugarcane cultivation. For Kilombero, less income share from non-sugarcane activities might imply less participation in non-sugarcane employment, hence leading to higher concentration in cane production and thus making more profit. Household dependent ratio on the other hand, indicated that 60% of the total household members constituted dependents. This denotes that most households were comprised of economically less active members who might not contribute significantly in activity participation, thus, influencing positively on farms' inefficiency.

With regard to the result from the Cobb Douglas stochastic profit function, the initial maximum-likelihood estimation included capital and herbicides in addition to the price of fertilizer, wage rate, and farm size. The coefficients of capital and herbicides were not significant in both areas (Kilombero and Turiani). Msuya and Ashimogo (2005) had similar observation. Capital and herbicides were therefore dropped from the analysis due to the fact that capital seemed not applicable for the productivity of ratoon crops. It was noted that sugarcane crop is harvested up to 6 recommended cycles whereby the first harvest crop is known as “plant cane” and requires capital for land preparation, but the subsequent crops grown back from the portion of the stock left under the ground after harvesting, called “ratoon crops”, do not require capital for further land preparations, only weeding and fertilising are necessary. The observed less importance of capital in production of ratoon crops is consistent with the work of Idiong (2007). On the other hand, herbicides/ pesticides were not applied by the majority of the smallholder cane growers. Only 19% of the smallholder cane growers from the study sample in Kilombero applied herbicides, and in Turiani, 0.01% applied herbicides on their crop. Herbicides/pesticides were perceived very expensive relative to smallholder cane growers’ income, although they are important inputs in improving quality and quantity of sugarcane yields.

The pooled data revealed that the coefficients of fertilizer price and farm size were 0.314 and 0.705, respectively indicating that 1% increase in the fertilizer cost and farm size, *ceteris paribus*, would lead to a corresponding increase of sugarcane profit by 0.314% and 0.705%, respectively. However, area specific result indicates that Kilombero exhibited a positive and statistically significant influence of fertilizer price and farm size on profit at 1% significance level. In Turiani, fertilizer price was not statistically significant different from zero and farm size had positive influence on profit and statistically significant at 1% significance level. Coefficient of labour wage was also positive, but statistically insignificant different from zero in Kilombero. In Turiani labour cost was positive and statistically significant at 10%. The intercept coefficient for fertilizer (DFERT) was negative and statistically insignificant different from zero. As explained earlier, this confirms that even without including this dummy in the profit frontier function the estimated parameters would be unbiased.

With exception of land size, the elasticities for fertilizer and labour costs were theoretically expected to exhibit an inverse relationship with profit, but with our results, theoretical expectation was not met. What was observed rather denotes that higher costs of fertilizer and labour lead to higher levels of profit. Even though this outcome contradicts the theoretical expectation, it is sensible. This finding corroborates with Long and Yabe (2012) who reported positive relationship between fertilizer cost and profitability of rice production in Vietnam's Red River Delta. Likewise, Adamu and Bakari (2015) reported similar relationship between fertilizer price and profit among Rain-Fed Rice Farmers in Northern Taraba State, Nigeria. They argued that positive relationship between cost of fertilizer and farm profit can be explained to imply that when farmers resorted to using high quality fertilizers in a proper manner and timely would increase yields per area planted and subsequently increases farm profit, all other variables held constant. Similarly, Ansah, Oduro, and Osea (2014) found in their study a positive relationship between herbicide and farm profit when estimated profit frontier function. They argued that farmers in Ghana were facing both counterfeit and original herbicides. Therefore, for the better results farmers had to increase cost by choosing original product which was quite expensive but potency and efficacy in controlling weeds well and a consequence of better yields and profits if other things were to remain constant. In our study, positive relationship between price of fertilizer and farm profit can be explained in similar manner as previous studies had argued. Because descriptive results indicated that there was serious underutilisation of fertilizer in both areas which was associated with lower yields and profits especially in Turiani where land size cultivated with sugarcane was relatively larger than in Kilombero. This means that even though increase in fertilizer application increases costs, but for a rational farmer who aspires to maximise profit is willing to adjust input usage for higher yields. Therefore, the effectiveness of increased fertilizer towards optimal amount in improving soils might subsequently lead to more yields that translate into higher profits, *ceteris paribus*.

Concerning profit efficiency and factors affecting inefficiency, it was revealed that there was a wide efficiency variation among sugarcane outgrowers in the study area. It was further noted that most of cane growers (90%) in Kilombero seemed to be skewed towards profit efficiency level of 71% and above. In Turiani, only 20% seemed to

exhibit profit efficiency level of 71% and above. This indicates that more than three quarters of the farmers in Kilombero were fairly efficient in sugarcane production, as opposed to Turiani where more than three quarters were less efficient. The observed differences in profitability between Kilombero and Turiani can be explained by differences in terms of market access and production practices. Market access includes output price offered and payment modalities including timing of payment. Likewise, production practices include proper and adequate usage of agricultural input and crop management in general. In all these aspects Kilombero farmers were better off compared to their counterparts in Turiani.

At individual level, there were a number of factors affecting inefficiency. The inefficiency model revealed that education, market access, and gender were not statistically different from zero. The coefficient of education level of the sugarcane outgrowers was positively correlated with profit inefficiency in Turiani. This denotes that as education level increases profit inefficiency also increases. The possible explanation to this result is that sugarcane cultivation in the study areas was dominated by individuals who attained lower level of education (a maximum of primary school education). Farmers who had secondary education level were more productive than their counterparts. But in Kilombero, the coefficient of education had negative sign. This means that farmers' efficiency level increases with increase in their education. Msuya and Ashimogo (2005) had similar observation; they found that more educated farmers were more efficient than less educated ones. However, increase in education level has a limit, beyond which efficiency may decline. In this study those who had secondary education exhibited higher efficiency level than any other category of education. Those with post-secondary education were less efficient probably because they had opportunities to participate in other income generating activities than agricultural employment. Lanjouw et al. (2001); Winters et al. (2002); de Janvry et al. (2005) reported similar observations.

Market satisfaction was a dummy variable which aimed particularly to capture the role of CF on farm profitability by accessing outgrowers' perception on pricing mechanisms and payment modalities. The variable was assigned the value of one if the outgrower

perceived satisfied from one or both categories of arrangements and zero if other otherwise. Although the variable was not significant, its coefficient had negative sign in Turiani, implying that those who perceived satisfied by market access were more efficient than those who were not satisfied. This corroborates with the descriptive statistics of the profit efficiency by farm-specific and institutional characteristics (Table 4.3).

Unfortunately, those who were satisfied with market were very few only 19% in Turiani. That is, about 81% of cane growers in Turiani agreed that their performance in terms of achieving high profits and high yields was adversely affected by the low price offered to their cane yields including delayed payments. While in Kilombero it was 4.5% of the cane growers who experienced difficult in pricing and payment mechanisms. This is as expected since perceived good pricing and payment modalities motivate farmers to actively and efficiently participate in sugarcane cultivation. The coefficient of gender had negative sign and statistically insignificant in both areas, denoting that male sugarcane growers were more efficient in profit making than female cane growers. This could be explained by the fact that the African culture, Tanzania in particular, female have multiple responsibilities including taking care of the family. Such responsibilities may split time and consequently, affect fully engagement in sugarcane cultivation.

Ownership of non-agricultural asset, non-sugarcane income share, part-time, and location variables were statistically significant different from zero. The coefficient of non-agricultural asset was negatively related with profit inefficiency at 10% significance level, implying that those farmers who were endowed with non-agricultural assets were efficient in profit making compared to non-agricultural asset poor cane growers. The reason could be the fact that asset ownership signposts wealth-ness of an individual. Wealth status of an individual farmer increases opportunities e.g. chances of acquiring credit or loan. Such opportunity not only motivates an individual to engage fully in farming activities but also increases capability to perform farming activities because loan on disposal can be used to obtain important farm inputs (fertilizer, hybrid seeds) as opposed to asset-constrained farmers.

The share of non-cane income was included to reflect the relative importance of other sources of income than sugarcane. The sign of the estimated coefficient was positive and statistically significant at 1% level in Kilombero, but negative and statistically insignificant in Turiani. Positive sign in Kilombero suggests that those outgrowers who had opportunity to increase income from other sources than sugarcane were likely experience higher inefficiency in sugarcane farming. This suggests that cane growers who earn more income outside sugarcane had considerably spent much time and effort in other income generating activities than sugarcane production, and thereby become part-timers in cane production.

An interesting observation was that, part-time in sugarcane cultivation played an important role in raising profitability and reducing inefficiency in Kilombero. But in Turiani part-time in sugarcane farming increased inefficiency and reduced profits. This was confirmed by the positive coefficient which was statistically significant at 1% significance level for Turiani, and negative and significant at 5% in Kilombero. Conventional wisdom suggests that part-time indicates the extent of involvement in an activity, implying that those sugarcane growers who engaged partly in other activities failed to pay much attention to sugarcane cultivation, as opposed to those who specialised in sugarcane farming.

However, income earned from other activities may offer higher benefits for sugarcane farms, probably by relaxing credit constraints currently facing most small scale farmers. Thus, part-timers in Turiani were likely to earn income from other activities which took much of their time and spent less time and effort in sugarcane farms. This is because sugarcane growers in Turiani could not use sugarcane fields as collateral for securing loan, thus income from other sources would be used to relax financial problems. In contrast, farmers in Kilombero who engaged in sugarcane cultivation had the opportunity to secure loan from various financial service providers including commercial banks such as CRDB and National Microfinance Bank (NMB) and other financial intermediaries like Private Agricultural Sector Support (PASS). Thus, they had incentive to intensify more in sugarcane production, even by re-injecting income obtained away from sugarcane farming.

The locational characteristics are negatively correlated with profit inefficiency, highlighting that sugarcane outgrowers who reside in Kilombero operate at significantly higher levels of efficiency than those who reside in Turiani. This could be explained by their differences in terms of market access and production practices. It was noted that prices for sugarcane in Kilombero are slightly higher and payment received earlier than in Turiani. This motivates cane growers to spend much time and effort in taking care of sugarcane crops. The result corroborates with the findings of Rahman (2003) who reported that farmers located in regions with well-developed market infrastructure perform significantly better than their counterparts in poorly developed market infrastructure.

4.7 Conclusion

The results of this study have shed light about heterogeneity of smallholder cane growers in Kilombero and Turiani and tipoff areas that could be important for policy intervention and poverty reduction. It was noted that sugarcane growers in the study areas are differentiated. That is, it appears that there are substantial differences in incomes, profitability and efficiencies between Kilombero and Turiani farmers. These differences partly come from differences in the usage of production inputs such as fertilizer, land and labour. It denotes that these variables were important in contributing towards higher sugarcane yields and profitability to farmers because movement in factor prices has a major impact on profitability. Thus, special attention has to be made to ensure that fertilizer is made available consistently and timely and if possible at a subsidised cost. This is because the prevailing contract farming arrangement in the study areas does not guarantee input provision including fertilizer.

The analysis of profit efficiency concluded that on average 29% of farms in Kilombero operate below frontier profit and thus makes loss in their sugarcane production due to a combination of both technical and allocative inefficiencies. In Turiani it was 45% of farms who operate far below frontier profit. On the other hand, cane growers appear to utilize substantially smaller amounts of inputs than would be appropriate. Kilombero used 58% of the required amount while Turiani used only 18.7% of the required amount. Further, investigation shows that non-agricultural asset ownership among cane growers

in Kilombero and Turiani has a higher chance to participate in other income generating activities away from sugarcane cultivation, thereby decreasing profitability and increasing inefficiency in sugarcane production as result of splitting off labour time in multiple activities. Similarly, the findings indicate that sugarcane cultivation is male dominated and male sugarcane growers are more efficient than female growers. Thus, females should be encouraged to participate in sugarcane cultivation and the minds of the society about the perception of assuming females as the overall handler of the family matters should change in order to allow this group to have full time participation in sugarcane farming.

The study also found an interesting observation in Turiani that part-time in sugarcane cultivation raises profitability and reduce inefficiency, although in Kilombero part-time in sugarcane farming increases inefficiency and reduces profits. As explained earlier on, this is due to the importance of income from outside sugarcane in relaxing financial constraints in Turiani where sugarcane fields cannot act as collateral nowadays. Meanwhile location variable indicated that farms located in Kilombero were more profitable than those located in Turiani. This is as expected since there are many opportunities in Kilombero which may facilitate farm profitability including remunerative prices, high possibility of access to credit and high factory output absorption.

Perception on market satisfaction although not significant in the regression, descriptive statistics shows that those who were dissatisfied by pricing and payment mechanism exhibited high profit inefficiency implying that market access restricts attainment of optimal frontier profit and efficiency to smallholder cane growers. Cane pricing and payment procedures are among the terms in the contract farming agreement representing market arrangement in the study areas. It has been a source of misunderstanding between cane growers and processors in Turiani, because contract negotiations do not provide a room for win-win discussion, a buyer has more power in negotiation. Ultimately, the smallholder farmers become price takers while buyers are price setters (URT, 2006). Improvement can be realised if government intervenes to regulate the implementation of contractual arrangements.

Finally, the study concludes that other variables necessary for productivity and profitability such as seed cane and capital equipment were not considered important in our study probably due to the nature of the study itself which focused much on ratoon crops rather than plant crops. With these findings, it is possible to increase profit from sugarcane cultivation without introducing new agricultural technologies. It is obvious that smallholder cane growers can be assisted to increase production and productivity using the available resources and technology rather than focusing on introducing new technologies which could not only be hard for them to afford but also to adopt. Similar observation was concluded in the study by Al-hassan (2008).

4.8 Policy implication and recommendation

Since the estimated parameters of Cob Douglas stochastic profit function, profit efficiency estimates, and descriptive statistics all convey the same message that smallholder cane growers are resource allocative inefficient, there is a need to introduce sensitisation programmes regarding resource use and management among smallholder cane growers in the study areas to help them abandon the traditional farming practices. It is also recommended that there should be political will in making and implementing policies that would facilitate farmers' ability to secure timely essential agricultural services to support in their production process.

Descriptive statistics have shown that pricing and payment mechanism affects negatively farm profitability in both areas. This is an indication that farmers are not satisfied with market arrangements which is a sign of failure of the CF scheme. This could be due to lack of government involvement in the contract farming arrangement. This calls for government intervention in the contract farming scheme to ensure that: 1) there is strong and affordable enforcement infrastructure in the study areas, 2) there is indicative price as it has been doing in other crops like cotton, and 3) there is a plan for the provision of subsidised inputs e.g. fertilizer. Additionally, outgrowers' associations and cooperatives should provide forums where smallholder cane growers can express their dissatisfactions over prices and timing of payment. Such initiatives could improve farm profitability and smallholder cane growers would obtain considerable income from sugarcane cultivation.

CHAPTER FIVE

CONTRACT FARMING AND SUGARCANE OUTGROWERS' INCOME DIVERSIFICATION STRATEGIES

5.1 Introduction

This chapter addresses the third specific objective of this study, which was established to determine the levels of diversification among cane growers and factors affecting diversification. The assumption for this objective was that smallholder cane growers who are more efficient were expected to behave differently in terms of diversification decisions compared to those who are less efficient as result of engaging in contractual arrangements. In responding to this objective we divided this chapter into six sections. Section 5.2 provides background information on sugarcane subsector and diversification strategy. Section 5.3 provides the theoretical consideration including definition and explanation of the major concepts, theoretical and empirical linkage between livelihood assets and CF, and finally the conceptual framework. Section 5.4 is the methodology used which covers diversification analysis and econometric modelling. Section 5.5 presents results and discussion, and Section 5.6 provides concluding remarks and policy implication.

5.2 Background information

Sugarcane production in Tanzania has portrayed a significant socio economic impact in terms of employment and revenue. Sugarcane subsector provides direct employment to about 14,000 people and is the outlet for the produce of over 30,000 farming households (Nkonya & Barreiro-Hurle 2012). Likewise, it provides total earnings of about 4 billion annually and contributes to the government revenue for about 1.7% of the total tax revenue (Nkonya & Barreiro-Hurle, 2012). However, sugarcane outgrowers in Tanzania have been working in hurdling environment in which sugarcane prices have been low relative to unit cost (Matango, 2006). These difficulties and others have generated substantial debate about the need and potential level of government support. As result contract farming was introduced as policy intervention to tackle these challenges.

However, since the inception of CF arrangements, many problems have been reported including low prices, delayed payments, heavy taxes to farmers, and inefficiencies in the sugar milling industry (Nkonya & Barreiro-Hurle, 2012). The consequences have been stagnation in output, declining farmers' income, and declining productivity (Nkonya & Barreiro-Hurle, 2012). These are the issues that have become a cause of concern for farmers to look for alternative income generating activities in order to smooth their incomes. Diversification studies reveal that farm households who face difficulties in their primary activities tend to look for alternative options, such as diversification into other income generating portfolios, or migration to develop productive activity elsewhere (Singh 2004; Reardon, Berdegue, Barrett, & Stamoulis, 2006). They do so in order to sustain their livelihoods, stabilise income, reduce risks and increase welfare (Escobal, 2001; Zhang *et al.*, 2002; Shi *et al.*, 2007).

The importance of income diversification has been acknowledged everywhere globally. For example off farm income as a diversification strategy accounts for about 35% and 50% of total income of rural households in developing countries (Schwarze & Zeller, 2005; Haggblade *et al.*, 2010). In some countries the share of income from diversified activities is high up to 75% of total income on average (Davis *et al.*, 2008). According to Haggblade *et al.* (2007), the income share of the diversified activities is expected to increase substantially in the coming years in Sub Saharan Africa.

In Tanzania the role of diversification and the incomes generated from diversified activities in rising rural farm households' total income has been remarkable for many years. Studies done in Morogoro Region in Tanzania have revealed that 50% of households' incomes are derived from crops and livestock sources, and 50% from non-farm sources comprising wage labour, off-farm self-employment and remittances (Ellis & Mdoe, 2003). These contrast with the more recent study by Covarrubias, Nsiima and Zezza (2012) which reports that 30% of total income comes from non-agricultural sector in Tanzania. All in all, growing of the income share from diversified activities is a reflection of growing level of participation in the diversification of activities. In rural Ghana for example, the participation rate of diversification was 74% of the farm

households in the year 2004 (Jolliffe, 2004). While in Taiwan participation was 75%, and in the United States it was 65% (Fernandez-Cornejo, 2007).

Based on the background information on diversification highlighted above, it is clear that farm households in developing countries do not either rely entirely on agriculture or undertake little or no activities out of agriculture, the perception which existed very long time ago and led policy makers to pay low attention on the role of diversification and concentrate on the agricultural activities at the expenses of non-agricultural activities (Jacobson, 2010). It is now important for poverty policies to have a fairly robust understanding of the role of diversification in rising households' income and poverty reduction. Understanding the role of diversification according to Ellis and Mdoe (2003) helps to determine the balance of public resources utilization between promoting increases in agricultural productivity versus providing support and services to non-agricultural activities. But, such initiative calls also for further understanding of factors behind households' participation strategy, given that participation of households in diversification is controversial.

Some studies have established that diversification decision is associated with higher incomes. That richer households are more likely to diversify income in new agricultural and non-agricultural activities mainly for capital accumulation purpose than poor household, see for example Ellis and Mdoe (2003); GFA (2009). Contrary to this argument, others have hypothesized that diversification of income is usually associated with rural poverty. Those households whose incomes are relatively low and cannot provide sufficient livelihood because of vulnerability, lack of assets, drought, and low productivity are likely to find out ways of survival by engaging in other income generating activities (Minot 2007; Reardon *et al* 2006).

Fortunately, according to Shi *et al.* (2007) many diversification studies have paid much attention to the role of asset endowment in gaining access to the diversification in off farm employment and not on decision making (see for example Zhang, Huang & Rozelle, 2002; Xia & Simmons, 2004). Studies which have looked at diversification decision have focused on a particular activity e.g. migration, livestock, or by treating diversified activities as one group without disaggregating them (Covarrubias, *et al.*,

2012; Lie, Rich, Kurwijila, & Jervell, 2012; Zhang *et al.*, 2002; Zhu, 2002). Similarly, the role of CF in influencing diversification has been given little attention except Sharma and Singh (2013) who used time series data for the time period 1970/71 to 2008/09 to examine the role of CF on crop diversification decision in Punjab.

This study intended to bridge this gap by investigating the determinants of income diversification among smallholder sugarcane growers under contract in Kilombero and Turiani by disaggregating non-sugarcane farming activities. This is because CF arrangements have been in place for many years in the study area, and sugarcane production trend has been fluctuating in Kilombero and declining in Turiani after contacts were introduced. Fluctuating and declining in the productivity of a primary activity have implication on the adoption of livelihood strategies by the smallholder farmers. Based on the livelihood approach, farmers facing such trend have no option than diversification by adopting additional productive activities.

Consequently, a number of questions can be raised, for example; (i) what extent sugarcane growers participate in other income generating activities? (ii) Does CF have an influence on such participation? (iii) What are the factors that determine diversification out of sugarcane cultivation? To address the above mentioned questions, the study has undertaken three objectives (i) to determine the levels of diversification among sugarcane growers (ii) to determine factors influencing participation in non-sugarcane activities among outgrowers (iii) to determine factors affecting income diversification in the study area.

5.3 Theoretical consideration

Theoretical consideration section explores general diversification concept using Sustainable Livelihood Approach and how it is linked with contract farming towards adoption of livelihood strategies. Various livelihood assets are discussed both theoretically and empirically in relation to diversification. At the end, the conceptual framework is developed and discussed based on the theoretical and empirical literature.

5.3.1 Diversification as a concept

Diversification is conceptualised in the lenses of Sustainable Rural Livelihoods Approach. Diversification has been defined differently by different scholars but all share common features reflecting the “diversification” concept. It is about undertaking activities or household employment outside primary activity (Escobal, 2001). Diversification is also defined as the process by which rural families construct a diverse portfolio of activities in their struggle for survival and in order to improve their standard of living (Ellis, 1998). Thus, from the definition, it is clear that diversification is a strategy arising following economic, political, social and environmental situations confronting the household. These socio-economic situations are clearly analysed in the Rural Livelihood Framework, a holistic and dynamic framework based on four elements, namely assets, context, strategies and outcomes.

Assets are considered to be stocks of capital that can be used directly or indirectly to generate livelihoods. On the other hand, context is an aspect which conditions the option for livelihood strategies (De Haan, 2012). Context consists of two distinct aspects, namely: vulnerability (e.g. shocks, trends, seasonality) and institutions (e.g. laws, policies, culture, levels of government and private sector). Strategies according to Ellis (2003) refer to the activities that generate the means of household survival, such as intensification of existing productive activity, diversification by adopting additional productive activities, or migration to develop productive activity elsewhere. On the other hand, the outcomes could be increased food security, higher incomes, better access to health and education. For more details of the background and origin of sustainable rural livelihoods approach see for example De Haan (2012).

According to this framework, asset ownership is fundamental for undertaking production, engaging in labour markets, and in other activities in the economy. This implies that the ability of the household to participate in any activity would depend on the access to or ownership of different types of assets. Assets heterogeneity among households offers dissimilar opportunities to participate in various income generating activities. According to the livelihood framework, resource endowment, institutions and vulnerability (shocks such as drought, floods, war, market regulation) are the

determinants of rural households to undertake a wider range of activities in order to secure their livelihoods.

Categories of assets which the framework is built upon include human, social, physical, financial and natural (Ellis, 2003). Ownership or access to these assets influences the capability of the household to act upon various livelihood strategies (Haggblade *et al.*, 2007). Since majority of households in developing countries are highly constrained by resource endowment, various initiatives have been introduced to build households' capacity to attain and sustain their livelihoods. One of these initiatives includes contract farming scheme. This study uses livelihood framework approach to evaluate and discuss how CF can influence and strengthen capability of farmers to diversify in various activities. Contract farming theoretically, provides the farmers with various services. Such services contribute towards accumulation of assets directly or indirectly. Mechanism of accumulating assets is through the roles played by CF such as mitigation of uncertainties on the market, accumulation of capital stock through skills acquired and income received (Masakure & Henson, 2005). Such roles of CF form the bases for the linkage between contract farming arrangements and livelihood assets, consequently to the farm household decision to diversify. This relationship is described theoretically in the subsection that follows below.

5.3.2 Livelihood assets and contract farming

The livelihood framework introduced above highlights the active role played by the rural households in obtaining and sustaining their livelihoods based on the asset endowment. However, it is known from the literature that the majority of smallholder farmers in developing countries have severe resource constraints (IFPRI, 2012; Swain, 2008). Contract farming can help to relax these constraints by offering some of these resources. This section establishes the linkage between livelihood assets and contract farming and provides analysis how these assets can contribute to strengthen households' capacity to participate in other income generating activities by looking at human assets, social assets, physical assets, and financial assets.

Human assets

Human asset include human capital which takes the form of skills, experiences, education, age, household composition and structure and agricultural knowledge (Green & Haines, 2008). Human asset is a prerequisite for enhanced capability necessary for increased production because of its ability to mobilise other resources. According to Jacobson (2010) contract farming contributes to the accumulation of human capital through a number of ways: (i) technical assistance, training and extension services offered increase farmers' knowledge and skills accumulation which could have been difficult to obtain without contractual arrangements (ii) technology adoption from the company to farmers promotes innovation and farmers' capability to produce efficiently (iii) income share from contracted crops received by farmers increases financial position and enables farmers to pay school fees for their children, hence, contributes to build human capital for the young generation. Households involved in CF would therefore theoretically be strengthened enough to actively participate in various income generating activities. From the livelihood framework perspective poor households with few resources are unable to adjust their capital stock to the different needs in activities outside agriculture. In this case with absence of CF arrangement poor asset endowed households would be restricted to invest more in nonfarm activities or could be "pushed" into wage labour activities to earn cash income (Schwarze & Zeller, 2005).

Social assets

Social asset is a kind of resource which includes networks, membership of groups, relationship of trust, norms that facilitate collective action (Lie *et al.*, 2012). Networks can not only facilitate the access to financial capital but also on migration decision, meanwhile relationship of trust can enhance households to access various sorts of local resources (Jacobson, 2010). In similar vein contract contributes to the social capital by establishing relationship between contractor and contractee which may promote a win-win negotiations for higher performance. Good relationship also reduces side selling cases since farmers may not find reasons to sell their produce to other buyers. Absence of side selling makes business work as usual. CF not only creates relation between company and farmers but also between farmers themselves. Many contracts require

farmers to form groups through which the network is created. Such network facilitates communication among farmers and helps to exchange experience, give or receive advice and it may lead farmers to a better position in accessing financial resources, thereby relaxing financial constraint. Social capital has been also widely considered important aspect for integrating actors together in the value chain. Membership in associations and network creation for example result in relationship development and trust which reduce opportunistic behaviour through repeated interaction among individuals. Therefore, costs related to effective monitoring is greatly reduced. Indeed, networking through associations helps to establish mechanism for securing labour, skills, and informal credit which ultimately would encourage smallholders participation in farm activities both sugarcane and non-cane crops. Unfavourable relationships created by poorly implemented CF for instance was predicted to have positive association with engagement in nonfarm activities, because breach of contracts is a common problem ever existed among parties involved in the contractual arrangement, implying lack of willingness to comply with the obligations pre-agreed. Such behaviour pushes the smallholders to other income generating activities. Gennrich (2002) argues that willingness to comply can only be assured through enforcement mechanisms which penalize breaches of contracts and conflicts. If enforcement mechanisms are weak or do not exist, no obligations to comply can exist and thus, individuals tend to find out alternative livelihood strategies. Generally, this study anticipated that household access to social networks should increase diversification capability of the household.

Physical assets

Physical assets include roads, production equipment, transport facilities which enable people to pursue their livelihoods (Lie *et al.*, 2012). Farming equipment such as tractor, irrigation facilities, and livestock are grouped as productive assets which can be used to generate household income direct and or influence households' participation in both agriculture and non-agriculture activities. The contribution of CF to physical assets is through facilitation to access input and extension services which farmers might not have been able to acquire without contract. Since such inputs are important in the production process, they increase incentives to participate in a particular activity for the farmers

who were formally constrained by these inputs. Similarly new technology and capital equipment for farming and for other activities when are made available to farmers registered in the contractual arrangement enable them to participate in various activities for betterment of their livelihoods. Other assets falling under physical capital includes infrastructures such as access to market and roads which are positively linked to non-agricultural activities.

Natural assets

Natural assets include land, water, environmental resources which are fixed resources that choices of rural livelihood strategies depend on. Access to these resources allows households to intensify in agricultural activities as opposite to off-farm employment (Reardon et al., 2006). Through remunerative price offered to the contracted crops, higher incomes are generated from it, which can be used to acquire more land or promote investment in irrigation facilities leading into access to water, thus relaxing rain fed production risks. Therefore, farm size was predicted to have positive relationship with income share from farm activities, but it might have negative relationship with non-agricultural activities. Access to land for instance, may allow smallholder farmers to participate more in sugarcane cultivation and non-cane agricultural activities as opposed to off-farm self-employment, migration and wage jobs. Although increased income from agricultural employment from both sugarcane and non-cane crops can lead to an increase in investment in off-farm self-employment, but most likely is used to intensify in sugarcane production.

Financial assets

Financial assets are economic resources (Lie *et al.*, 2012). They include savings, credit access, and regular remittances. Savings help to mobilise financial resources vital for advancing investment in agriculture and non-agricultural activities. Financial capital can be used to invest in human capital or procure agro-input to improve productivity and livelihoods in general. Through better payments done regularly, CF offers high incomes which can partly be saved in order to support or initiate other business ventures. Savings may also be used to accumulate financial resources and therefore solve the financial

restraint resulted from limited access to credit facing most farmers in developing countries. Credit access may have mixed impact on diversification strategies. Lack of credit can be a driving factor for households to participate in nonfarm activities in order to generate cash to finance farm activities by selling their labour. Access to credit on the other hand, motivates farmers to intensify in agricultural activities because they can be assured for the availability of input.

Based on the livelihood framework and the role of CF in accumulating assets essential for diversification decision, household under CF decides to reallocate the resources with whom it is endowed depending on the motives behind. Such motives are classified by the literature as 'push' or 'pull' factors towards participation into income diversification strategies. Different income generating activities that household can participate in have been classified by various scholars, for example: within farm activities, local off farm activities, and migration (Demurger, Fournier & Yang, 2010); nonfarm sector such as manufacturing and services both self-employment and wage employment activities, and agricultural sector wage employment (Escobal, 2001); farm activities such as production and gathering of unprocessed crops or livestock or forest, and nonfarm activities including processing, transport or trading unprocessed agricultural, forest, and fish products (Barrett *et al.*, 2001).

Diversification in this study involves a decision to grow non-sugarcane crops such as maize, rice, cassava, sorghum, and banana and or engage in nonfarm activities like small scale businesses and services (hair cutting, crafts, small shops or kiosks, bakeries), and or engage in farm-wage employment for whatever reasons. A cane-grower is defined in this context as a smallholder farmer who undertakes sugarcane farming under contract as primary activity, he/she may also decide to engage in secondary activities such as production of other cash crops like sesame, coconut, sunflower, cashew nut and cotton or engage in off-farm activities in case there is some kind of shocks in sugarcane farming. This is so because of the importance of cane income in the study areas where cane cultivation creates large income enough to influence the equilibrium condition for self-sufficiency of farm production. The role of the dominating income source onto the livelihood strategies is also observed by Escabot (2001) who argues that in most

developing countries changes of an activity that creates large share of total income have influence on livelihoods strategies. This means, if there is any shock which affects an activity that creates large share of the total income, would lead to instability of the overall income of the household, and hence diversification decisions.

Literature indicates further that various shocks and opportunities affect decision towards income diversification. Shocks and opportunities together are categorised as “push” and “pull” factors for diversification (Barrett *et al.*, 2001). Regarding the push factors, farmer can be faced with three constraints, namely diminishing factors of production, liquidity, and transaction costs (Escobal, 2001). Likewise, other literature view push factors as a response on both long term shocks (economic turndown) and regular or seasonal shocks (prices and production fluctuations, droughts and floods) (Reardon, 1997). This study has included price and payment modalities to capture fluctuation in sugarcane farming. Some view ‘push’ factors as reasons for diversification born of desperation e.g. poverty, lack of assets, vulnerability, and disaster (Ellis, 2003), or in order to handle livelihood risks (Barrett, Bezunt, & Abdillahi, 2001; Carter, 1997), or because farm output is inadequate due to drought, lack of land, or poor productivity and those falling below the minimum required to support livelihoods face little choice except diversification into other alternative income sources (Reardon *et al.*, 2006). This study included technical efficiency scores as proxy for productivity on diversification.

Pull factors on the other hand include benefits created by new income opportunities evolved from market development, improvement of infrastructure and for the purpose of asset accumulation (Hart, 1994; Demurger, Fournier, & Yang, 2010), or because relative returns are better in that sector (Reardon 1997). Similarly, pull factors could be a matter of choice and opportunity; just for accumulation; specialisation according to comparative advantage accorded by superior technologies, skills or other endowments (Ellis, 1998; Barrett & Reardon, 2000). In order to capture the influence of returns on diversification this study has included income share from sugarcane farming (contracted crop).

Although vulnerability and other risk factors can be assumed to be similar in a specific area, other determinants can differentiate the extent to which households choose to

diversify (Tesfaye *et al.*, 2011). For example, farm households may have stronger incentive to diversify in nonfarm activities but might be constrained by capital in the form of human resource. For example age of the household head is believed as an important element used as a proxy for experience and knowledge gained over time and plays an integral role in diversification decision. Demurger *et al.* (2010); Demissie & Legesse (2013); Shi *et al.* (2007) found that young adults are more engaged in all types of non-farm activities than elder individuals, and Escobal (2001) reports that age is not significant determining factors of off-farm employment income.

5.3.3 Empirical evidence

Several studies have established relationships between livelihood assets discussed above and the adoption of diversification. For instance, there is positive relationship between high level of education and participation in well-paying non-agricultural activities for a range of countries including Tanzania (Lanjouw *et al.*, 2001), Brazil (Ferreira & Lanjouw, 2001), Mexico (Taylor & Yunex-Naude, 2000; Winters *et al.*, 2002), China (de Janvry *et al.*, 2005); and Ethiopia (Demissie & Legesse, 2013). However, other studies have revealed that education has a contrasting role on decisions to participate in off-farm activities (De Brauw *et al.*, 2002; Demurger *et al.*, 2010).

On the other hand, Demissie and Legesse (2013) found that education has negative effect on nonfarm wage employment in Ethiopia, meaning that heads of households with education have low probability and willingness to participate in wage labour, instead they are pulled towards more profitable off-farm self-employment activities. In Latin America De Janvry and Sadoulet (2001) find that education has no role to play on participation in agricultural wage employment activities or income, but a key factor in determining off-farm self-employment activities.

Other forms of human capital that have influence on diversification are experience and household size. Escobal (2001) in Peru, found that young women even without education but with experience increased their participation in nonfarm activities of their own such as bakeries, sewing shops, photocopy services, repair shops, and restaurants. likewise, Demissie and Legesse (2013) report positive relationship between participation

in off-farm wage employment and the number of economically active members of the household, but negative determining factor for off-farm wage employment for the households that have more children in school. Those households that had a large number of children attending school had low preference to participate in off-farm wage employment activities, while larger families comprised of workforce members tend supply more labour to farm and nonfarm sectors than small families. This allows some wives to assure home maintenance activities like child care, cooking and own farming and the surplus labour to work in other income generating activities (Reardon, 1997).

The impact of land size holdings has mixed results, for example a study by Yunez-Naude and Taylor (2001) in Mexico found a positive relationship between land size and participation in crop and livestock activities; negative relationship between land size and participation in wage employment; but positive relationship between land size and livestock income; and also no relationship between land size and crop income. Winters, Davis, Corral (2002) found similar results between land size and crop income in Mexico. In Nicaragua, Corral and Reardon (2001) found positive but diminishing effect of land size and total farm income, but negative association with non-agricultural wage employment participation, as well as farm wage income. While in Egypt, Adams (2002) found positive relationship of land size and to the overall non-agricultural income. In Chile, Berdegue *et al.* (2001) found that there is negative association between land size and non-agricultural employment participation or income. In china, de Janvry *et al.* (2005); Zhang and Li (2001); Zhu and Luo (2005) found negative link between land size and non-agricultural employment participation. Whereas in Ethiopia Demissie and Legesse (2013) using Tobit result reveal that participation in nonfarm self-employment was positively influenced by size of cultivated land, although result obtained from multinomial Logit hinted that size of cultivated land does not significantly affect participation.

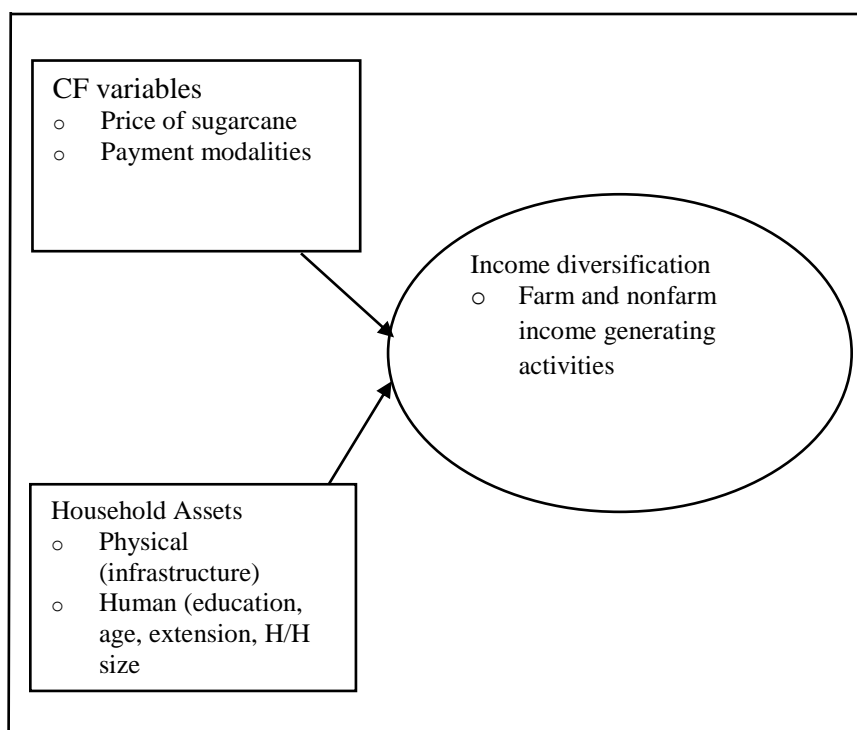
Lack of credit can be a driving factor for households to participate in nonfarm activities in order to generate cash to finance farm activities by selling their labour. On the other hand, income share obtained from contracted crop can be used to finance other activities in order to improve livelihoods (Jacobson, 2010). Nonfarm labour market is

characterised by entry barriers especially for farm households who are poor (Shi *et al.*, 2007), thus, access to nonfarm activities needs social connections. Absence of social connections limits employment opportunities (Xia & Simmons, 2004; Zhao, 2003; Zhang & Li, 2003).

5.3.4 Conceptual framework

The reviewed literature provides evidence to suggest that household assets and incentive factors contribute to farm household diversification in various income generating activities. Hence, these factors perceived to influence households' participation in diversification of activities are summarised in the conceptual framework (Figure 5.1) built and extended by Ellis (2003); and Barrett, Bezunt and Abdillahi (2001). The framework recognises asset types owned or accessed by family members which include human capital (age, household size, education, and experience), physical capital (road), financial capital (access to credit), natural capital (land), and social capital (networks and associations). CF variables include price of sugarcane and payment modalities. However, for the case of the current study, whether this is the case and to what extent do these factors influence diversification decision three questions are posed: *To what extent do cane growers participate in other income generating activities? Does CF have an influence on such participation? What are the factors influencing participation in non-cane activities?*

Figure 5.1: Conceptual framework



Source: Modified from Elis (2003); Barrett, Bezut, and Abdillah (2001)

From the conceptual framework above, the two broad factors affecting household diversification decision are conceptually related to diversification decision and summarized hereunder. The CF variables considered in the study are the price of sugarcane and payment mechanisms practiced in sugarcane farming. First of all, it is important to note that these are not exclusive; there could be other factors which were not considered by this study. Price of output of the contracted crop plays two roles. The first role is its direct influence on livelihood strategies (refers to the arrow from CF variables' box towards decision to diversify). That is better price increases income to the household and may lead to crop intensification or diversification into other farm and off-farm activities for capital accumulation. The second role is its influence on livelihoods assets owned by the household. Better pay accumulates financial and non-financial assets which have both direct and indirect influence on diversification. This means that when the income from contract farming is higher enough, part of it can be used to procure physical assets such as agricultural inputs, irrigation tools, or the income may serve as a credit constraint relaxer, ultimately the livelihood strategy could be

intensification of the contracted crop or diversification into other activities away from cane production.

Household assets include natural, physical, human, financial and social as explained earlier on, which give rise to a flow of output. They determine the capability of the household to participate in farm or off-farm employment activities (refers to the arrow from household assets towards decision to diversify). This means that a household who owns most of these assets is competent enough to participate without entry barriers into off-farm activities (diversification), but also is competent to intensify in a particular activity. The opposite is also true for the household who lacks livelihood assets in his disposal; he/she may face some difficulties related to diversification because start-up capital may become entry barriers. Ultimately, he/she may end up sell his/ her labour at low-wage employment activities.

Given household endowments in both livelihood assets and incentive factors (Figure 5.1), it is assumed that smallholder farmer makes decisions to diversify or intensify to specific employment activity by comparing the marginal return between the available opportunities (Ellis, 1993). This implies that farmers are rational in the sense that they allocate labour-time and other resources to the activity with highest return among other alternative activities available to them.

The application of this assumption to this study is that sugarcane outgrowers could either intensify in sugarcane cultivation or diversify into other non-cane activities depending on the returns from each category. If sugarcane farming payoff is relatively higher than other sources of income, rational households would intensify in sugarcane farming. Otherwise we would expect higher diversification when sugarcane farming is associated with performance constraints.

5.3.4.1 Analytical model

The conceptual framework described above can be summarised in mathematical representation. This is based on the standard model for income diversification adapted from Escobal (2001). This model establishes the direction of relationships between factors assumed to influence participation in income portfolios and the intensity of

incomes from diversified activities. According to Escobal (2001) the model assumes that household problem is utility maximisation subject to several constraints, namely resource constraint and market for tradable constraint. Resource constraint covers financial resources such as cash and credit access; physical resources e.g. production technologies and roads; natural resources such as land; human resources such experience, education, and household size. Market constraints on the other hand include effective prices of input and outputs.

The first order conditions for this model give a system of factor supply and demand function which in turn permits the determination of the labour allocation between farm and nonfarm sectors. The reduced equations for the model have the following form:

$$Y_{ij} = f(P, Z) \tag{5.1}$$

Where; Y_{ij} represents net incomes from non-cane farm, off-farm, and wage job sector activities; ' P ' represents the vector of exogenous input and output prices. ' Z ' Variables represent vectors of different fixed assets that are available to the household (human, physical, financial, natural and social assets). For the sake of this study ' P ' variables represent CF variables that is perception of sugarcane outgrowers on prices and payment mechanisms. The idea behind is that the explanatory variable ' P ' captures the influence of contract farming arrangements through these variables which determine the type of livelihood strategy to be adopted by the sugarcane outgrowers. The assets under ' Z ' variables in the model above include age, education, experience in nonfarm activities, and household size for human asset; infrastructure such as road for physical asset variable; natural asset variable include land size owned or accessed by household: credit access proxy for financial asset and networks for social capital. The detailed relationships of variables used in the regression are described in expansion from under section 5.3.1.2.

5.4 Methodology

This study was conducted in Kilombero and Turiani in 2012. Both areas are dominated by farming as the main livelihood activity. Sugarcane was regarded as the most dominant cash crop in the area, and crops like maize, rice and cassava were considered

the most important source of food and very little for sale. Kilombero and Turiani demonstrate similarities in terms of land access and fertility, market access, off-farm and wage employment. They both practice contract farming in the sugarcane sub-sector, although they differ in the implementation of the contract farming scheme. A sample size of 386 smallholder farmers was obtained through random sampling from those who grew sugarcane. Out of this sample, a total of 195 smallholder farmers were from Turiani division, and 191 smallholder farmers were from Kilombero. Detailed sampling procedures are thoroughly discussed in chapter two.

The data were collected through a structured questionnaire administered on individual household head using personal interviews. The data collected were cross-sectional data for the 2011/12 farming season based on a household survey carried out during the months of July and August 2012. The sample survey was carried out by the selected enumerators who had good background in data collection and who attended an additional one week intensive training offered to them. The training intended to make them acquainted with the questionnaire which was pre-tested in the study areas to enhance familiarisation and make necessary corrections of mistakes including observing relevance of the questions. Thus, irrelevant information was removed. From the improved questionnaire, a wide range of data were collected regarding specific crop production activities, household composition and structure, institutional structure, crop selling and other income generation activities.

5.4.1 Analysis of diversification and Econometric modeling

5.4.1.1 Diversification analysis

Diversification is theoretically analysed based on three main objects, namely assets, activity and income. Selection of an object for the analysis of diversification is discussed in detail by Barrett and Reardon (2000). Assets are considered as the major objects of agent's choice in order to maximise income and/ or minimise risk. There are also a number of studies that have used assets as objects of analysing diversification (see for example Carney *et al.*, 1999). However, several criticisms have been posed on the use of assets as objects of analysing diversification. According to Barrett and Reardon (2000)

productive assets for example, are used in multiple activities and therefore pose some challenges on how such assets can be used in a single activity. It is also argued that it is difficult to determine the true value of some assets due to asset market imperfection especially in developing countries. Indeed, Barrett and Reardon (2000) argue that for the assets to be used as an object for diversification analysis, must be treated as a vector of physical quantities instead of aggregating them into single money metric.

Other equally important object normally used for analysing diversification is an activity. According to Barrett and Reardon (2000) studying diversification based on activity, there is a danger of ignoring unearned income sources. Furthermore, it is difficult to examine patterns of diversification because activities cannot be aggregated into single money metric just like assets. Alternative way of studying diversification is by using income approach. Income is the end outcome of the income generating activities to which both productive and non-productive assets are allocated. It is easy to consider unearned income options such as transfers and remittances. It is also easily possible to convert in-kind payments into money metric due to the development of goods markets as compared to assets market (Barrett & Reardon 2000). Therefore, in analysing factors affecting diversification decision, this study has adopted income approach based on its strengths and weaknesses of other approaches as pointed out in the literature.

(a) Measurement of income diversity

In measuring diversification out of sugarcane cultivation, this study uses income from non-sugarcane activities. Whereas, in measuring the overall diversity of income, the study applies the Shannon Equitability Index (E). This index is derived from the Shannon Index (H). As adapted for this study from Schwarze and Zeller (2005), it is expressed as follows:

$$H_{income} = -\sum_i^S [(incshare_i) \cdot \ln(incshare_i)] \quad 5.2.1$$

Where S represents the number of diversified income sources, and $incshare_i$ implies share of income from activity i in total household income. According to Schwarze and Zeller (2005) the Shannon Index (H_{income}) takes into account the number of income sources and their evenness, and it is calculated for every household. Shannon Index has

a tendency of increasing continuously with high diversification. From the Shannon Index (H), the Shannon equitability index (E) is calculated as follows:

$$E = \left[\frac{H_{income}}{-\sum_{s=1}^S \left(\frac{1}{S} * \ln \left(\frac{1}{S} \right) \right)} \right] * 100 \quad 5.2.2$$

Where the denominator is the marginal possible Shannon Index, and E ranges from 0 to 100, states in percentage share of the actual income diversification in relation to the maximal possible diversity of income (Schwarze & Zeller 2005).

Other indexes used to measure diversification theoretically include: Entropy index and Simpson index of diversification. The two indexes range between (0,1). Entropy index and Simpson index of diversification have been used in crop diversification by Mesfin *et al.* (2011) and Sharma and Singh (2013), respectively. With exemption of Shannon equitability index, Entropy and Simpson indexes are normally estimated using OLS estimation technique (see for example Mesfin *et al.*, 2011; Sharma & Singh, 2013), whereas the Shannon equitability index suits for Tobit estimation technique due to its ability to take into account zero observations from non-diversified activities, as well as the number of income sources and their evenness.

(b) Measuring determinants of diversification

Factors that influence diversification are examined through econometric modeling. Two steps are involved; the first step involves investigation of factors influencing diversification out of sugarcane farming. This is measured by using income from diversified activities, namely incomes from wage jobs; off-farm employment; and non-cane farm activities. The second step involves examining the factors influencing the overall mix of the income measured by the Shannon equitable index introduced under equation 5.2.2 above. In both regressions, the same set of explanatory variables is used with additional of two variables in step two. These variables are income share from sugarcane cultivation and technical efficiency scores. Income share from sugarcane farming intends to capture the influence of CF income on the overall diversity, and technical efficiency scores is meant to capture the influence of the levels of productivity

on the overall diversity. Incomes from diversified activities and the Shannon equitability index are continuous dependent variables (see Table 5.1).

5.4.1.2 Modeling diversification

Based on the conceptual framework, equation 5.1 was employed and expanded to include variables that were analysed in the regression. Tobit model was used due to the fact that most of the observations to the dependent variables are zero. This indicates that a large fraction of the sample in the study areas reported to have zero income from a diversified activity. In cases like this, Tobit model has been considered superior statistical model over others because it does not throw available information on the value of the dependent variable. Hence, using different models other than Tobit in such case would cause bias (Greene, 2008; Wooldridge, 2002). Schwarze and Zeller (2005); De Janvry and Sadoulet (2001); Woldenhanna and Oskam (2001); Escobal (2001) use Tobit models in similar settings. Indeed, the aim of the study also necessitates the choice of the models to be used. If for example, the aim would have been to explain the probability to diversify and the corresponding outcome without regard for the value (intensity) of the outcome, probit model could provide a suitable statistical model (Tobin, 1958), or Logit model could have been used if the purpose was to evaluate the initial decision to adopt a new income generating activity (Wanyama *et al.*, 2010).

In this context, the approach set up by Schwarze and Zeller (2005) was adopted. This approach specifies total income from an activity as an independent variable. The aim is to capture the activity participation. Other studies designed to capture activity dependence for example, the independent variable is specified as a share of total income arising from an activity (Escobal, 2001; de Janvry & Sadoulet, 2001; Fisher, 2004) or as share of time spent by household in each farm employment (Nghiem, 2010). In addition, the Shannon equitability index (E) is calculated to find out the determinants of overall diversification in the study area for the sugarcane outgrowers. A number of literature support the use of the index (E) to determine overall determinants of diversification by Tobit models e.g. Schwarze and Zeller (2005). Therefore, this study has two sets of equations. The first equation modeled annual levels of diversified income with household capacity variables (human, physical, financial, and natural capital) and

incentive variables (price and payment). The second equation is the diversification index (E) treated also as a function of capacity variables and incentive variables including income share from sugarcane (contracted crop) and technical efficiency scores. Guided by the theoretical framework, the stochastic income equation underlying Tobit was expressed as follows:

$$y_i^* = X_i\beta + u_i \quad 5.4.1$$

A Tobit model dependent variables are activity income for the first model, and Shannon equitability index (E) for the second model. The model can take the value of zero or positive values according to Schwarze and Zeller (2005); Sesabo and Tol (2007); Demissie and Lengesse (2013), as follows:

$$y_i = y_i^* \text{ if } X_i\beta + u_i > 0 \text{ and } y_i = 0 \text{ if } X_i\beta + u_i \leq 0 \text{ for } i = 1, \dots, N \quad 5.4.2$$

Where N is the number of observations, y_i is the dependent variable that captures the i^{th} household income index (E), y_i^* is a partial latent dependent variable that captures i^{th} household propensity to earn income from a diversified activity, X_i is a vector of independent variables, β is a vector of unknown coefficients to be estimated, and u_i is an independent, normally distributed error term assumed to have mean zero and constant variance σ^2 . It was estimated using maximum likelihood, where the lower limit was set at zero and u_i parameterized as $X_i\beta$. Hence, the Tobit model log-likelihood function is expressed as follows:

$$\ln L = \sum_{y_i > 0} -\frac{1}{2} \left[\ln(2\pi) + \ln \sigma^2 \frac{y_i - \beta(X)}{\sigma^2} \right] + \sum_{y_i = 0} (\ln [1 - \Phi \left(\frac{\beta X}{\sigma} \right)]) \quad 5.4.3$$

Where, Φ represents the cumulative density function (cdf) of the standard normal distribution. The overall log-likelihood function (equation 5.4.3) is made up of two parts. The first part corresponds to the classical regression for the uncensored observations, while the second part corresponds to the relevant probabilities that an observation is censored. Thus, the maximum likelihood estimator has the desirable properties for being both consistent and asymptotically efficient (Greene, 2008; Sesabo & Tol, 2007; Demissie & Legesse, 2013).

5.4.1.3 Variables used

Dependent variable

Based on the models specified in equation 5.4.1, it is clear that this study has two sets of dependent variables. The first set of dependent variable is a continuous income variable by source, with four sources i.e. (i) non-cane farm income, (ii) off-farm employment income, (iii) wage employment income, and (iv) income from sugarcane cultivation. The second dependent variable is Shannon equitability index (E) calculated by expression 5.2.2. While it was relatively straight forward to determine income from activities such as wage employment and sugarcane farming, incomes from non-cane crop production and livestock were obtained using the general formula for calculating income from each of these sources. The formula to obtain net income includes subtracting total costs of production from the total values of production. Total costs of production exclude labour inputs of household members because it is ambiguous to measure the opportunity cost of family labour (Nghiem, 2010). For crops and livestock for example, the value of production equals the value of sales and the value of domestic uses, earned or used by a smallholder cane grower over the past twelve months preceding the survey. Data about output produced were valued at 2012 domestic market prices for crops, animal and animal products and are directly available in data set for the POLICOFA survey (2012).

Similarly, income from off-farm employment is the sum of all amount earned by a smallholder cane grower from all self-employment activities over the past twelve months and are directly obtained from the datasets. The income from sugarcane sales are well documented on the smallholder cane grower's payment invoice. The invoice indicates sales revenue and all costs related to the cane production, harvesting, loading, and transportation, including other deductions like membership contribution for the year in question. Subsequently, the total income from all sources is easily computed just by adding all net incomes from farm employment, off-farm employment, wage employment and sugarcane income.

Independent variables

The explanatory variables identified and assumed to influence the dependent variable are broadly categorised into two, namely, asset variables and incentive variables. Asset variables are the livelihood capital-assets owned by household. The asset variables includes the following: (i) land ownership, which is a total land area owned by a household measured in acres; (ii) non-farm experience, which is the number of years household has experience in non-farm activities; (iii) education of the household head who grows sugarcane, measured in terms of years of schooling the household spent; (iv) age of the household head who grows sugarcane, (v) credit access, which is a dummy variable having a value of one if the smallholder cane grower experienced difficulty in accessing credit facilities for the past five years from the survey year, zero otherwise; (vi) access to infrastructure, a dummy variable having a value of one if the smallholder cane grower had access to infrastructure such as road, and zero if otherwise; (vii) extension services, a dummy variable having a value of one if the smallholder cane grower had access to extension services, zero if otherwise. The incentive variables on the other hand, include (i) cane price and payment mechanisms were represented by a dummy variable, with the value of one if the smallholder cane grower was satisfied by market arrangements, zero if otherwise; (ii) income share from sugarcane cultivation and (iii) technical efficiency scores were included specifically for the Shannon equitability index. Variables used in the Tobit models for regression analyses are summarised in Table 5.1.

Table 5.1: Variables used in the Tobit for regression analyses

Variable name	Nature of the variable	Unit	Variable description	sign
<i>Dependent variables</i>				
Income by source (Tobit)	Continuous	Tsh	Amount of income per household from diversified activities.	
Shannon Index (E)	Continuous		Shannon equitability index for overall diversity	
<i>Independent variables</i>				
Land owned	Continuous	Acre	Total farm holdings which is main asset for allocation to competing of farm income source	+ve
Income share	Continuous		Income share from sugarcane a proxy for CF performance. It is expected to have mixed impact on diversification.	+/-
Education	Continuous	year	Education of household in years was hypothesised to influence the farmer. Many years in schooling meant higher probability to select a higher income portfolio	+ve
Age	Continuous	year	Age of household head was hypothesised to have positive or negative influence on household decision to select a given income portfolio	+/-
Credit access	Binary		Access to credit hypothesised to positively influence household to select a given income portfolio	+ve
Infrastructure	Binary		Access to road hypothesised to positively influence household to diversify in a given income portfolio.	+ve
Extension	Binary		Extension contact gives farmers training, and is hypothesised to positively influence farmers to choose a given income portfolio	+ve
Cane pricing & payment	Binary		Better prices on cane production and timely payment are incentives for farmers to allocate more resources to it for enhanced income, the opposite is also the case.	+ve

Source: Researcher's own perspective

Table 5.1 above indicates the general influence of explanatory variables on independent variable. There is no doubt that some independent variables can have mixed influences depending on the nature of the income stream. Experience in non-farm, for example, is hypothesised to influence the farmer positively to select a given income portfolio, but can also have negative influence on sugarcane production or farm employment (see Table 5.2).

Table 5.2: Expected signs for explanatory variables and heterogeneity on different income streams

Asset type	Explanatory variables	Expected signs			
		Farm employment	Off-farm employment	Wage employment	Sugarcane cultivation
Natural	Land owned	+	-	+/-	+
Human	Education	-/+	+	+/-	-/+
	Age	+	+	+	+
	Household size	+	+/-	+/-	+
Financial	Credit access	+	-/+	-/+	+
Physical	Paved road	+	+	+	+
Social	Extension	+	-	+/-	+
Incentive	Cane pricing & payment	-/+	-	-	+

Source: Researcher's own perspective

Table 5.2 summarizes the expected sign of each independent variable for each equation. The explanatory variables that belong to household capacity and incentive variables are distinguished by asset type and incentive respectively. The first household capacity variable in the table is natural asset (land ownership) of individual household. It is indicated that participation in farm employment, wage employment and sugarcane cultivation is positively related to the land ownership, implying that having arable land is very important precondition for households who intend to become involved in these activities. In which case, landless household is less likely to engage in farm self-employment because he/she lacks the capacity to embark on such an activity or can hardly participate in sugarcane cultivation because hiring land for sugarcane crops is expensive due to the nature of the crop. Sugarcane is a perennial crop which is continuously harvested up to 5 seasons or more. This means that a household has to rent out land for five years or more. On the other hand, land ownership is predicted to have negative influence on off-farm employment activities because for a household to engage in off-farm self-employment, particularly in petty business, for example, may not necessarily need to own farm land.

Education, age, and household size are proxies for human asset. Education is predicted to play role in obtaining off-farm and wage job information. Sugarcane outgrowers with more years of schooling are predicted to be more productive, and therefore, have better opportunities to intensify in cane production and or find out other income generating activities. However, in agricultural employment, according to Shi, Heerink, and Qu

(2007), education plays a minor role. Age of the household is predicted in such a way that older households are likely to be involved in either in-farm activities or off-farm employment because they have experience and more networks that are relevant for finding wage jobs. On the other hand, household size composed of economically active members is likely to influence positively participation into all categories of activities, although it might have negative influence on wage jobs and off-farm employment.

Access to credit relaxes financial constraint, and sugarcane outgrowers might be motivated to actively engage in sugarcane cultivation depending on the type of credit. If it is a financial credit sugarcane outgrower might be motivated to use it to finance other productive activities or purchase inputs for cane production. But if it is non-financial credit such as input credit, sugarcane outgrowers could be motivated to use such input on credit in sugarcane production.

Access to physical infrastructure e.g. paved road creates incentives for smallholders to diversify. Access to road lowers transport and other transaction costs; hence incomes of the smallholders may increase, making it possible to accumulate capital for further business. Similarly, sugarcane output prices and payment mechanisms may affect incentives for participating in non-cane farming, off-farm employment as well as wage employment. Sugarcane outgrowers who face problems of prices on their sugarcane outputs, or problems in payment systems feel more pressure to find alternative sources of income from those which fetch better and remunerative prices and receive payments timely. In other words, the more remunerative prices the more incentives to cane growers' investment decision in those most productive venture than splitting out labour-time and resources in other uncertain employment opportunities.

Income share and productivity variables are treated in the Shannon equitability index model only for examining their influence on overall diversification. Income from sugarcane cultivation has mixed influence on diversification. It may lead to increase in diversification if found low or decreases diversification if found high. That is high income from sugarcane motivates sugarcane growers to intensify in sugarcane farming because it is a signal for well performing contract farming, such that household finds no reasons to leave contract. But again, high income may empower sugarcane growers to

diversify in non-cane activities because they could have obtained capital necessary to start-up new productive activities. Productivity on the other hand, works almost the same way as income does in influencing intensification/ diversification. High productivity may lead to higher incomes which have mixed outcomes towards diversification strategies.

5.5 Results and discussion

Tobit results are presented in Table 5.6. The table shows the number of left censored observations in each equation including likelihood ratio test. It can be noted that all equations fit the data reasonably well. The indicators which support this argument include first of all the number of censored observations which reads more than one half are left-censored justifying the estimation method. Second is the likelihood ratio test with its p-value of 0.0000 indicating goodness-of-fit of the model. If the assumptions were violated then the estimates would be inconsistent (Greene, 2008). The null hypothesis that neither the probability nor the size of the non-zero responses depends on the explanatory variables: $H_0: \beta_1 = \beta_2 = \dots \beta_n = 0$ was also rejected, based on the likelihood ratio chi-square value used to test LR chi-square statistic with nine degree of freedom which was significant as indicated by a small p-value, 0.0000, concluding that at least one of the regression coefficients in the model was not equal to zero.

5.5.1 Descriptive statistics

The survey results indicate that 278 smallholder cane growers out of 386 respondents were involved in different sub-categories of non-sugarcane activities in 2012. This number is equivalent to 72% of all smallholder cane growers in the surveyed areas. On average, 89.2% of respondents who participated in non-cane income generating activities were from Turiani and 54.5% were from Kilombero (Table 5.3). This participation rate highlights that households' involvement in multiple activities was a common phenomenon in the study areas, particularly in Turiani. Likewise, this rate of participation implies that smallholder sugarcane growers in Turiani were highly diversified in non-cane income generating activities compared to their counterparts in Kilombero. The main income generating activities were: farm employment, off-farm

employment, and wage employment. Income from farm employment activities encompasses growing non- sugarcane crops and animal keeping, with maize and rice being the dominant food crops. Off-farm employment on the other hand, included all kind of self-employment activities such petty business, tailoring, bicycle/motorcycle renting, mason and carpentry. Wage employment was dominated by employment from private sector, central and local governments. Other activities were day worker and traditional healing (see Figure 5.2).

The average farm size cultivated with non-cane crops such as maize and rice were 3.6 acres in Turiani and 1.7 acres in Kilombero. This implies that other crops were given more priority in Turiani than in Kilombero. On average, 82.5% of respondents in Turiani have had non-farm experience, and for Kilombero it was only 53% of them who had non-farm experience. This implies that higher participation of smallholder cane growers in diversification of activities in Turiani might be attributed to experience of household head in off-farm businesses. On the other hand, the average level of education by household head was 6 years of formal schooling in Turiani, and 6.3 years in Kilombero. According to formal classification of Tanzanian education system, the average suggests that majority of smallholder farmers in the study area had less than primary school education implying low levels of awareness of farmers on issues related to cane production under contractual arrangement. This might be the source of their incentive to diversify in other activity portfolios.

Average age of household head was 53 years and 46 years in Turiani and Kilombero respectively. The average age in Turiani was dominated by adult heads who seem to be responsible for taking care of large families including sending kids to school, which encouraged them search for more income sources. Contrary to Kilombero, the average age was dominated by young heads and seems to bear fewer burdens of family matters, thus, no incentive for them to search for extra income generating activities. Moreover, sugarcane outgrowers in both areas were facing similar constraints in access to credit and extension services as the t-test statistic shows insignificant different with probability ($p = 0.4505$). About 91% of respondents found it difficult to access credit in Turiani and 92% in Kilombero. Since credit is a very important source of fund for procuring inputs

and farm implements meant for sugarcane cultivation such as fertilizer and water pumps for irrigation, then lack of credit encouraged majority of the smallholder cane growers to abandon the crop and concentrate in other income generating activities. Access to extension services was 17% and 16% in Turiani and Kilombero respectively. This is an indication that extension service is relatively scarce, which might hinder smallholder cane grower in taking full responsibility in sugarcane production in the study areas.

Table 5.3: Descriptive statistics of the variables used in the Tobit models

Variable definition	Turiani (n=195)		Kilombero (n=191)		Both areas (n=386)	
	Mean	Std.	Mean	Std.	Mean	Std.
Diversification decision (1 = Yes, 0 = No)	0.89	0.31	0.54	0.49	0.72	0.45
Land owned in total (acres)	8.08	10.38	5.31	14.52	6.71	12.66
Education level of farmer (in years)	6.00	3.25	6.30	3.01	6.25	2.90
Age of the farmer (in years)	53.12	15.93	46.10	13.51	49.6	15.16
Difficulty in credit access (1 = Yes, 0 = No)	0.91	0.28	0.92	0.27	0.91	0.27
Household size (number of members)	4.81	2.55	4.83	1.91	4.82	1.98
Access to infrastructure (1 = Yes, 0 = No)	0.04	0.20	0.05	0.23	0.05	0.21
Extension services (1 = Yes, 0 = No)	0.17	0.37	0.16	0.37	0.16	0.37
Cane pricing & payment (1=Yes, 0=No)	0.60	0.49	0.04	0.21	0.32	0.46
Shannon equitability index (E)	9.93	12.69	7.04	11.63	8.50	12.25
Income from sugarcane (000' Tsh)	506.7	640.6	1548.5	175.2	1022.2	96.1
Income from off-farm (000' Tsh)	876.3	3144	958.3	3174.9	916.9	160.6
Income from wage jobs (000' Tsh)	231.7	930.3	155.7	737.3	194.4	840.1
Income from non-cane farming (000' Tsh)	1013.3	79.2	584.8	99.2	801.4	64.2
location variable (1= Kilombero, 0 otherwise)	0	0	1	0	0.4948	0.50

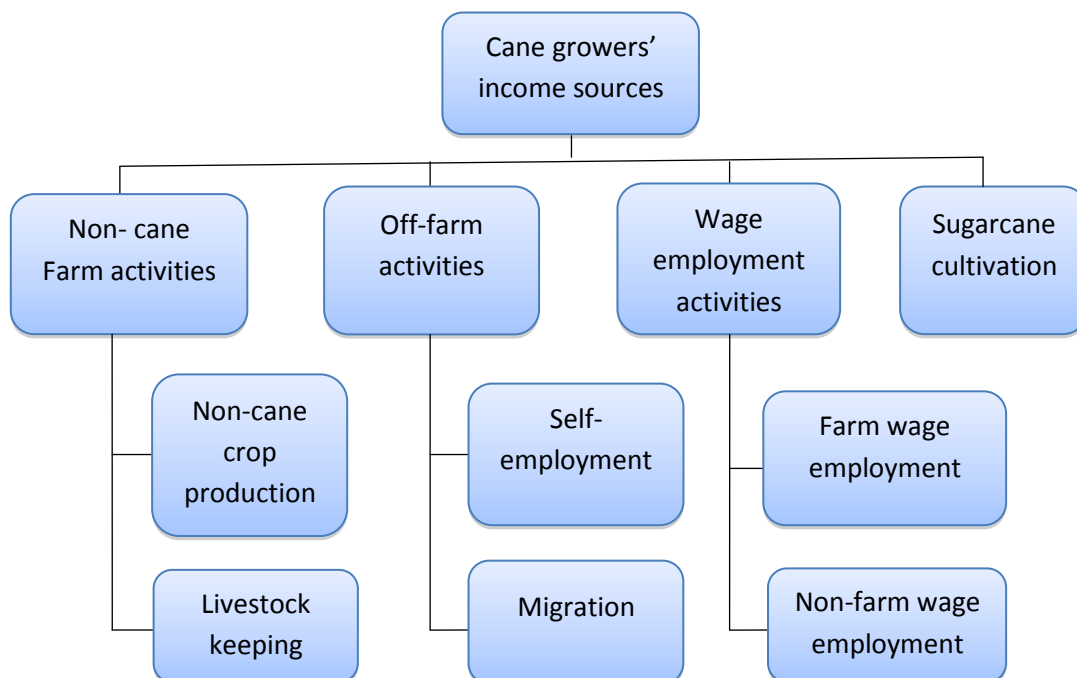
Source: Derived from POLICOFA field survey data (2012)

Table 5.3 indicates that income from sugarcane is relatively higher in Kilombero than in Turiani as indicated by statistical test showing significant different at 1% significance level, whereas, Turiani was leading for having higher income from non-sugarcane farming activities as confirmed by statistical test which shows significant difference between Kilombero and Turiani at 1% level of significance, highlighting that there was higher participation rate in farm activities in Turiani than in Kilombero. Another variable of interest was the Shannon equitability index, a proxy for the extent of diversification. The maximum indices were 70.3% and 55% for Turiani and Kilombero, respectively. These indexes percentage show that Turiani experienced more diversification than Kilombero as confirmed by a significant t-test statistic for heterogeneity in diversification at 1% significance level.

5.5.2 Sugarcane growers' participation in the diversification of activities

From POLICOFA household survey, four main types of diversification of activities were distinguished as follows: non-cane farm activities; off-farm activities; wage employment activities and sugarcane farming which was treated as a reference activity (Figure 5.2).

Figure 5.2: Classification of sugarcane growers' income sources



Source: POLICOFA household survey data (2012)

From figure 5.2, non-cane farm activities encompass production of all non-cane crops and livestock keeping. Non-sugarcane crops consist of both cash crops and food crops such as maize, rice, sorghum, cassava, legumes, and banana. Maize and rice were the dominant crops which consumed household resources competitively with sugarcane production in the study area. Off-farm activities consist of off-farm self-employment and migration. Off-farm self-employment encompasses a wide range of activities under entrepreneurial-initiatives such as petty business e.g. bakeries, photocopying services, repair shops, food vending and restaurants. Others include masonry, carpentry, bicycle/motorcycle renting, tailoring, traditional healing, and fishing. Wage employment activities include non-farm wage employment and farm wage employment. Non-farm wage employment encompasses a wide range of job opportunities for wages attainable

in public administration, private firms and individual small enterprises. Others were those working in construction and transportation, professionals in various sciences, education and training. Farm wage employment on the other hand, refers to agricultural related activities which involved the supply of paid labour on farms.

Participation rate for each activity is presented in Table 5.4. From the Table, finding from aggregated data shows that 88.5% of smallholder sugarcane growers were involved in non-cane farm employment activities. This employment option was the most important alternative income generating activity in the study areas, followed by the participation in off farm activities (32%), and wage employment had the lowest participation rate of all categories, only 9.4% of smallholder cane growers were involved. Similarly, findings from Table 5.4 for the disaggregated data portrayed similar trend. Finding indicated that participation rate in farm employment was highest (97.7%) and (73.1%) for Turiani and Kilombero, respectively. Followed by off farm employment (34%) for Kilombero and (29.9%) for Turiani. Very few cane growers participated in wage employment activities, only 9.5% in Kilombero and 9.2% in Turiani.

Table 5.4: Percentages of smallholder farmers involved in diversifying activity portfolios in the study areas for the year 2012

Activity	Kilombero (n = 191)		Turiani (n = 195)		Both areas (n = 386)	
	Frequency	%	Frequency	%	Frequency	%
Diversify (Yes = 1)	104	54.5	174	89.2	278	72
Farm employment	76	73.1	170	97.7	246	88.5
Off farm employment	36	34.3	52	29.9	88	32
Wage employment	10	9.5	16	9.2	26	9.4

Source: Calculated from POLICOFA survey data (2012)

5.5.3 Income share by activity to total household income in the study areas

In section 5.3 above we observed the pattern of participation rates in various income generating activities households were engaged in. Section 5.4 describes the contribution of each activity share to total household income in percentages. Detailed information is summarized in Table 5.5. From Table 5.5, it is observed that sugarcane cultivation was the most important income generating activity in terms of income share to total household income in Kilombero, where it provided about 47% of total household income.

In Turiani, sugarcane cultivation provided only 16% of the total income. It means that about 84% of the cane-growers' total income in Turiani was generated from other non-cane income generating activities, which reflects the increasing importance of other income sources in Turiani. The income percent share from non-cane sources supports the agricultural household theory that areas where household receives relatively lower prices of their agricultural products or have lower productivity relative to other activities tend to be motivated for more diversification. This was a typical Turiani case where sugarcane was offering low price compared to Kilombero and diversification was higher in Turiani than in Kilombero. This result corroborates with the study by Nkonya and Barreiro-Hurle (2012) in Tanzania which found that households in Ruvuma region are more diversified and tend to get a higher share of their cash from many sources than households in Kilimanjaro, because Ruvuma had higher poverty index 55.7% versus 33.1%.

Similarly, farm activities other than sugarcane cultivation constitute more important source of household income in Turiani. It contributed 42% of the total household income, and only 18% share of the total household income in Kilombero. Less contribution of the farm employment in total income of the smallholder cane grower in Kilombero could be associated with better performance in the sugar sector influenced by incentives such as remunerative cane price which makes smallholder holder cane grower allocate more time and labour in sugarcane production, as opposed to Turiani which offers relatively lower cane output prices annually. The other incentives could be favourable payment mechanisms. This finding is consistent with Ellis (1993:131) who argues "household will make decisions on whether more labour time should be allocated to farm production or non-farm wage or other self-employment activities by comparing the marginal return between these opportunities".

Off-farm employment plays the second important role in both areas. It contributes 30% and 33% of the total income in Kilombero and Turiani respectively. Most of the income generated from off-farm employment is mainly from self-employment in the petty business. This could be due to the fact that both areas are experiencing urbanisation and population growth as result of the influx of casual labourers searching for both temporary and permanent wage employment in the sugar factories and sugarcane-estates in the

surrounding areas. Wage employment income constitutes only 5% of the total income in Kilombero and 9% in Turiani.

Table 5.5: Activities participation rates and shares in total cane growers' income in Kilombero and Turiani

Activity	Kilombero (n = 191)	Turiani (n = 195)	Both areas (n= 386)
Farm employment			
Participation rate	39.8%	87.2%	63.7%
Mean income	568,010	1,079,243	823,626
Income share (%)	18%	42%	29%
Off farm employment			
Participation rate	18.8%	26.7%	22.8%
Mean income	933,150	864,620	898,905
Income share (%)	30%	33%	31%
Wage employment			
Participation rate	5.2%	8.2%	6.7%
Mean income	158,005	225,960	191,982
Income share (%)	5%	9%	7%
Sugarcane cultivation			
Participation rate	100%	100%	100%
Mean income	1,471,651	425,501	948,576
Income share (%)	47%	16%	33%

Source: Calculated from POLICOFA survey data (2012)

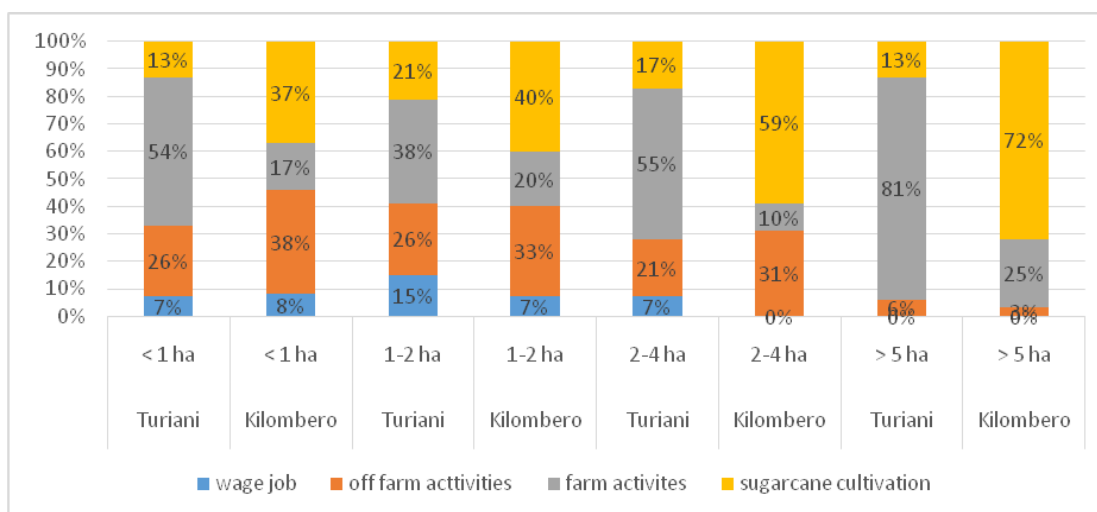
5.5.4 Income shares by size of asset endowments

Asset endowment was a key determinant for the household's decision to participate in various income generating activities. Figure 5.3 shows variations in income sources and shares by size of land holdings among smallholder farmers across study areas. From the figure it is observed that the rate of diversification decreases with increase in agricultural land holdings. Those households with small agricultural land holdings participated in various income generating activities, while those with large land holdings hardly participated in various income sources. Therefore, this illustrates the importance of asset endowment in determining household decision process to whether should participate in a given activity or not. Second, it is observed that income from sugarcane cultivation increases with increase in agricultural land holdings in Kilombero as opposed to Turiani where sugarcane income decreases with increase in agricultural land holdings, and income from other crops than sugarcane increases for larger agricultural land holdings. The observed heterogeneity of households in decision making in Kilombero and Turiani is a reflection of heterogeneity in the way contract farming was implemented. This can be

explained by the rewards offered by a particular activity. For instance, in Kilombero sugarcane pays more than other sources of income but for Turiani sugarcane pays less as compared to non-cane crops and/ or off-farm employment. Thus, Turiani sugarcane growers have less incentive to invest time and other resources in cane cultivation.

In Kilombero (Figure 5.3), sugarcane cultivation is more important for both landless and land-rich households in the study sample, because largest share of their total income comes from sugarcane. That is 37%, 40.3%, 56.6% and 72% for household with land holdings less than 1 ha, 1-2 ha, 2-4 ha, and above 5 ha respectively. Meanwhile, off-farm employment is ranked the second for landless households, and its importance decreases with increase in landholdings.

Figure 5.3: Income share by size of land asset endowments in the study areas



Source: Calculated from POLICOFA survey data (2012)

Concerning Turiani, farm activities other than sugarcane cultivation were most important for all categories of land holdings. The largest share of households' total income comes from other crops than sugarcane, and increases with increase in land holdings. It is observed that 81% of the total income for the land-rich category comes from other crops than sugarcane, while sugarcane contributed only 13% of the total household income in the land-rich category.

The result further indicates that households from Kilombero earned more income from sugarcane cultivation than their counterparts from Turiani. Similarly, Turiani households earned more income from non-cane farm employment than their fellow households from Kilombero. The mean income from sugarcane cultivation was significantly ($t = -5.3786$, $p = 0.0000$) different between households in Kilombero and their counterparts in Turiani. Likewise, the mean income from non-sugarcane farm employment was significantly ($t = 3.8273$, $p = 0.0001$) different between households in Kilombero and Turiani. Households in Kilombero had higher mean income value from sugarcane cultivation (Tsh. 1,471,651) than Turiani households (Tsh 425,501), at the same time, Turiani households had higher mean income value from non-sugarcane farm employment (Tsh. 1,079,243) than Kilombero households (Tsh. 568,010).

The observed differences were attributed to differences in motivation towards sugarcane cultivation. In Kilombero households were more motivated to participate in cane production than in Turiani. The motivation rests from the fact that Kilombero cane growers were paid higher and timely than their counterparts in Turiani who earned less and received payments late. More generally, differences in motivation towards sugarcane production were attributed to differences in implementation of contractual arrangements between cane growers and the millers in the sugarcane subsector. Another reason for observed differences in incomes from different activities was due to differences in the availability of agricultural inputs. Association of cane growers in Kilombero can arrange for the supply of input timely simply because they receive money timely from the miller. Unlike in Kilombero, Turiani cane growers used to receive and use subsidised agricultural inputs such as fertilizer in other crops than sugarcane because the marginal return from these crops was much higher than rewards offered in sugarcane cultivation.

On the other hand, the mean income value from off-farm employment and wage jobs proved statistically to be insignificant with $t = -0.2205$, $p = 0.4128$ and $t = 0.8182$, $p = 0.2069$ respectively. This indicates that both areas had similar off-farm and wage employment patterns.

5.5.5 Determinants of income diversification among smallholder cane growers

Table 5.6 reports the Tobit maximum likelihood estimates of the determinants of income diversification by activity using incomes from individual income generating activities. And Table 5.7 records the Tobit result for the determinants of the overall diversification and the underlying factors using Shannon equitability index. Theoretically, income diversification depends on various factors that can be divided into incentive and asset endowment factors. The incentive factors include sugarcane price and payment mechanisms, income share from sugarcane cultivation, technical efficiency in sugarcane farming and location. Factors like income share and technical efficiency were dropped from the analysis to avoid potential endogeneity problem which may result in inconsistent estimates of all model parameters. Income diversification decisions affect the total income and the shares of the individual income generating activities including share from sugarcane cultivation, thus both the numerator and the denominator of this variable would be endogenous.

Similarly, income diversification affects how much time and effort a farmer can devote to sugarcane production so that income diversification may affect his/her technical efficiency in sugarcane production. Furthermore farmer's personality and ability affect both his/her technical efficiency and his/her income diversification decisions. Asset endowment factors on the other hand include natural assets (land owned), human assets (education, age of the household head, the size of the working age of the members of household, extension services), financial assets (credit access), and physical assets (road). Likewise, the variable credit access was also dropped from the analysis because income diversification probably affects the creditworthiness of the farmer and hence, he/she may face difficulties/less difficulties to get a loan which may lead to endogeneity problem.

Finally the following variables were included for the analysis: land owned, education, age, household size, infrastructure (road), extension services, location (area), pricing and payment mechanisms since were considered exogenous. Extension service for example, is a free service offered by agricultural extension officers employed by the government, and it is not part and parcel of CF arrangements. Thus, farmers have equal chance to be

visited by the extension officer. Again, the crop understudy is a ratoon crop meaning that extension service was received or supposed to be received by a farmer a year or more prior to the commencement of the current study when the crop was planted at the first time. Likewise, sugarcane price and payment mechanisms are not affected by the farmer's personality because sugarcane price and payment modalities are clearly stipulated in the CF arrangements, hence pricing and payment modalities are taken as given. The matter of concern was whether individual farmer perceived the predetermined prices and payment modalities fair or unfair, and how did he/she react following such perception.

5.5.5.1 Determinants of Income diversification by activity

The Tobit maximum likelihood estimation results are presented in Table 5.6, where the determinants of income are indicated against individual income generating activities. The income generation activities include farm employment, off-farm employment, and wage employment.

Farm employment income

The Tobit model result showed that the variables land size, house hold size, and sugarcane prices and payment mechanisms are the determinants of farm-employment income, because they have statistically significant effects on farm employment income.

Land owned by the household head has significantly and positively effects on farm employment income at 1% significance level. This indicates that smallholder cane growers who own larger land holdings earned more income from farm employment than those with smaller land size. Escobal (2001) found similar results in rural Peru. Therefore, land rich cane growers have better position of earning more income as a result of engaging in farm employment because of their ability to access more land suitable for agricultural activities. It could also mean that smallholder sugarcane growers who cultivate larger area of plots have the capacity to produce more and that would enable them to accumulate capital for expansion of farm activities. This could be an indication that land is treated as a factor of production only in the agricultural activities, but not in the other two types of employments (wage jobs and off-farm employment).

The arable land in the study areas is mainly used for sugarcane production and for the production of non-cane crops such as maize, rice, cassava, and banana. Therefore, it can be concluded that ownership of fixed agricultural assets such as land increases the share of farm income (non-sugarcane farming in particular), and reduces the need for undertaking wage employment.

Table 5.6: Tobit maximum likelihood estimates of the determinants of income diversification by activity type.

Variable	Farm employment		Off-farm employment		Wage employment	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Constant	762708	1.75*	-1817300	-0.63	-3941169	-1.42
Land owned	41951.6	6.49***	22490.9	0.50	-141575	-1.09
Education	54892	0.32	2267642	1.84*	3049275	2.51**
Age of H/H	-7453.7	-0.31	-194253	-4.12***	-121750	-2.44**
Extension	68914.8	-0.29	1332555	0.88	-1023083	-0.59
Infrastructure	86904.3	0.22	-683665	-0.24	4596691	2.43**
Household size	137971	2.34**	824162.6	2.06**	190585.7	0.48
Price& payment	-427981	-1.96*	3097440	2.00**	-145131.8	-0.10
Area	-843563	-3.79***	-4106099	-2.72***	-2846652	-1.87*
Left-censored	140		298		360	
Uncensored	246		88		26	
Log-likelihood	-3946.47		-1628.41		-490.86	
Prob. (L.R. test statistic)>chi ² (7)	0.0000***		0.0000***		0.0001***	

Note, ***, ** and * imply statistical significance at 1%, 5% and 10% levels, respectively.

Source: Calculated from POLICOFA survey data (2012)

Household size measured in terms of number of economically active family members in the household has shown positive and significant influence on farm employment income at 5% level of significance. The positive relationship reveals that as the number of working age family members increases, the possibility of household to earn income from farm activities also increases. This implies that smallholder cane growers who have large number of economically active family members were able to participate in different agricultural activities and earn more income than those smallholder cane growers with small number of economically active family members. This is consistent

with the study by Demissie and Legesse (2013) which revealed that households with large active labour force family members earn more income from various activities compared to households with small number of working labour force.

Sugarcane price offered to smallholder sugarcane growers and the payment mechanism operating in the sugarcane subsector have shown significant and negative effect on farm income at 10% significance level (Table 5.6). This means that better prices and payment mechanism motivate households to participate and earn more income from sugarcane cultivation than in other non-cane farm employment activities. This is due to the fact that sugarcane is regarded as a high paying cash crop not only in the study areas but also in Tanzania at large. When sugarcane yield receives high price and payment made timely, cane growers have no incentive to engage in other low-value crops, instead the cash income from sugarcane cultivation can be used to re-invest in sugarcane farming.

Off-farm employment income

Off-farm employment income is significantly influenced by age, household size, education, area (location variable), and pricing and payment mechanisms. As it was predicted, age of the household head is found to be significantly and negatively associated with off-farm employment income at 1% significance level. It implies that as age increases the intensity of off-farm employment income decreases (Table 5.6). On the other hand, the result reveals that young household heads are more likely to participate in off-farm self-employment and derive more off-farm employment income compared to the older household heads. The findings by De Janvry and Sadoulet (2001); Mohammed (2008); Sosina *et al.* (2009); Demissie and Legesse (2013) coincide with this finding.

Size of the household members comprised of economically active labour force has significant and positive correlation with off-farm employment income. This variable has indicated positive and significant influence on off-farm employment income at 5% significance level. It means that the availability of large number of active labour force in a household family increases the capacity and ability of such household to participate in different income generating activities including off-farm employment. This is in agreement with the theoretical expectation.

Education of the household heads has significantly and positively affected off-farm employment income at 10% significance level (Table 5.6). The result tells that household with formal education had the possibility and capacity to participate and earn more income from off-farm employment. The result indicates further that education has no role to play in non-cane farm activities. This could be due to the fact that farm activities are carried out traditionally in the study areas and therefore education doesn't play much role. Hence, the probability and willingness of the smallholder cane growers with high education to participate in farm-activities is relatively lower than their fellow households without formal education. Probably because educated households are pushed towards other remunerative wage jobs and off-farm self-employment. This finding is consistent with Zhao (1997); De Brawn *et al.* (2002) who find influence of education on wage employment and nonfarm employment in China. It can be concluded that the higher the education level, the lower the incentive to participate and obtain income from farm activities and the greater the incentive to commit time to off-farm and non-farm wage employment.

The location variable (area) has significantly and negatively affected off-farm employment income at 1% significance level (Table 5.6). The interpretation is that the households residing in Kilombero are more likely to reduce their participation in off-farm employment activities than their counterparts in Turiani. This implies that households in Kilombero earn less income from off-farm employment as result of less participation in this type of employment. Some reasons can explain this phenomenon:

- 1) Kilombero households receive remunerative prices from sugarcane subsector and thus respond to this incentive by engaging most of their time and efforts in sugarcane cultivation compared to other types of employment activities available including off-farm employment.
- 2) Associations of cane growers in Kilombero are more organised and efficient than any other organisation of associations in other areas involved in sugarcane cultivation in Tanzania. The reason for their efficiency could be due to the availability of chances for the members to leave the association and join other association at any time if not satisfied by the performance of the former

association. In other words, there is competition among associations to retain and add new more members by performing satisfactorily in solving members problems related to sugarcane cultivation.

- 3) High participation rates in non-cane farm and off-farm activities for Turiani households is probably because they want to supplement their sugarcane incomes and reduce risks involved in sugarcane cultivation.

The perception on difficulties in pricing and payment modalities in sugarcane sector has positive and significant effects on off-farm employment income at 5% significance level. This is an indication that those farmers who feel unsatisfied by prices offered and the way payment modalities are handled in the sugarcane subsector have higher motivation to engage and earn more income in off-farm employment compared to those who are satisfied. This is as expected.

Wage employment income

Identified determinants of wage employment income analysed by Tobit model include education, age of the household head, infrastructure, and location. Education is a key factor in determining participation in wage jobs (Table 5.6). It has statistically significant and positive effect on wage employment at 5% significance level. Generally, it implies that the higher the education level the greater the capacity and motivation to secure wage jobs. In other words of similar meaning, this finding suggests that education plays an important role in gaining access to the more remunerative wage employment in both private and public sectors in Tanzania. De Janvry and Sadoulet (2001); Demissie and Legesse (2013) had similar results in their study on income strategies among households in Mexico and Ethiopia respectively.

The age of the household head is found to have negative impact on wage employment income. It is statistically significant and negative effect on wage employment income at 5% level of significance showing that as age increases, the intensity of wage employment income decreases (Table 5.6). This means that young people are more likely to participate in wage jobs and derive more wage employment income compared to older people. Access to infrastructure such as roads has significantly and positively

affected wage employment income although statistically insignificant in other income sources. This is contrary to other findings like Escabal (2001) whose findings reveal that access to roads and other key public assets raises the profitability of both farm and nonfarm activities. The current study finding suggests that only wage earning is raised for wage employment activities. The effect of location of the households on the wage employment income is found to be significant and negative at 10% significance level (Table 5.6). The result highlights that households who reside in Kilombero are likely to reduce their participation in wage employment and thus earn less income from this category of activity. Similar reasons explained under off-farm activity may also apply under wage employment. That is households in Kilombero are paid well in sugarcane cultivation and therefore have no incentive to participate in non-sugarcane employments including wage jobs. Generally, these results have revealed that wage employment income contributes very little to the total household income, and the participation rate was minor. The results corroborate with the review studies for Latin America and Africa (Reardon, 1997; Reardon *et al.*, 2001), which found that agricultural wage employment was a relatively minor activity. But the results are contrary to the study by Escobal (2001) in Rural Peru where through income decomposition method, they found that income coming from wage employment were important enough to account for up to 45% of income inequality.

5.5.5.2 Determinants of the overall income diversification

Tobit maximum Likelihood estimates in the previous section have shown diverse influence of predictors on various income portfolios of the sugarcane outgrowers. Similarly, the Tobit model results on the determinants of the overall diversification (Table 5.7) indicate that land ownership, education, size of the household, access to paved road, and location are important determinants of the overall diversification. The size of land owned has positive and significant influence on diversification as expected. These results suggest that as size of land increases, household has the capability to participate in other activities like farming non-cane crops such as maize, rice and cassava, including livestock production. That is, the contribution of land ownership to household income is mainly attributed by cultivating large area of plots for non-

sugarcane crops and plots for livestock grazing. This would raise households' capacity to increase farm production and income than those households constrained by land shortage.

Table 5.7: Tobit results for the determinants of overall diversification

Asset	Variable	Turiani		Kilombero		Both areas	
		Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Natural	Land ownership	0.14352	1.58	0.17993	2.12**	0.15539	2.63***
Human	Education	4.27818	2.31**	4.07726	1.50	4.02185	2.61***
	Age of the household	-0.57014	-1.67*	0.18247	0.28	-0.23851	-0.79
	Age squared	0.00319	1.05	-0.0036	-0.59	0.00289	0.10
	Size of the household	0.66897	1.04	1.79638	1.91*	1.32737	2.50**
	Extension service	2.40620	0.96	-2.2364	-0.58	0.28366	0.13**
Physical	Infrastructure (road)	2.88942	0.63	17.861	3.17***	10.11046	2.87***
Incentive	Price and payment	-2.11867	-1.11	10.4231	1.59	-0.44466	-0.22
	Location (area)					-8.42432	4.24***
Left censored			19		87		106
Uncensored			176		104		280
Log-likelihood			-711.66		-496		-1218.15
Pro. (LR. Test statistic) $>chi^2$ (12)			0.0001***		0.0004***		0.0000***

***, ** & * imply significance levels of 1%, 5% & 10%, respectively.

Source: Derived from POLICOFA survey data (2012)

Access to paved road has positive relationship with Shannon equitability index, implying that road has positive impact on diversification as expected. Household who has access to paved road can easily and quickly dispose of perishable goods, hence stands better to have higher income compared to the remote areas where there is limited access to better road networks. This finding is consistent with the findings of Schwarze and Zeller (2005); Sharma and Singh (2013). Household who attained high education on the other hand, has an opportunity to increase the number of income sources. This is shown by positive and significant correlation of education in years of schooling with Shannon equitability index at 1% significance level. This implies that household head with higher education could be considered to have better information, knowledge, skills and knowhow to participate in various income generating activities than households with lower education and or those who are illiterates, as they might face entry barriers in more attractive income earning opportunities. This result is consistent with Yunez-Naude and Taylor (2001) who find stronger impact of education on income from nonfarm activities in Mexico.

The size of the household with members aged between 16 and 65 increases the possibility of household heads to diversify their income in various activities, as informed by the coefficient of the household workforce variable which has positive and significant influence on Shannon equitability index at 5% level of significance. This implies that the larger the size of household members comprised of this age group the more the income diversification, as opposed to those households constrained by availability of working age family members. This result is as per theory expectation.

Location variable on the other hand has negative and significant influence on Shannon equitability index at 1% significance level. This suggests that households who reside in Kilombero are unlikely to diversify into other income generating activities, signalling that sugarcane cultivation has high returns than other sources of income, such that households have little incentive to split up their resources to other activities which have relatively less returns. On the other hand, pricing and payment modalities have positive and significant influence on Shannon equitability index in Kilombero at 10% significance level. This denotes that sugarcane growers who perceived pricing and payment mechanisms as constraints in achieving their performance in sugarcane production had the incentive to diversify away from sugarcane cultivation.

5.6 Concluding remarks and policy implications

This chapter has identified various income generating activities through which smallholder cane growers choose to participate. In addition to sugarcane cultivation, smallholder farmer participates also in non-sugarcane farm activities, off-farm employment and wage employment in Kilombero and Turiani, Morogoro Region.

Data suggest that the highest participation rate is found in non-cane farm employment (90.5% for Turiani and 40.5% for Kilombero) followed by off farm self-employment (27% for Turiani and 18.5% for Kilombero) and finally wage jobs (8% for Turiani and 5% for Kilombero). Households' decision to participate more in various activities is triggered by the rewards offered and risks associated with the activity. In Turiani for example households participated more in non-cane farm employment activities indicating that there is higher diversification in other activities in addition to sugarcane

cultivation due to less rewards and high risks associated with sugarcane business. In contrast, participation rate in other income generating activities is lower among households in Kilombero indicating higher cane intensification than diversification probably because remuneration is also high in the sugarcane subsector.

Weighing these four sources in the decomposition of households' total income by source, findings show that sugarcane cultivation is the largest contributor to total income in Kilombero, explaining on average 47% of the total household income followed by off-farm employment (30%). The other sources of income make only minor contributions for instance farm employment (18%) and wage employment (5%). In Turiani the largest contribution comes from non-sugarcane farm employment by contributing 42% of the total household's income, followed by off-farm employment (33%), sugarcane cultivation (16%), and wage employment (9%). Thus, at present 84% of the net income of the majority from Turiani households originates from activities other than sugarcane farming. This suggests that sugarcane cultivation in Turiani should certainly no longer be considered "important" as it has been so often in the past.

Our results also indicate that fixed asset ownership is among major determinants of diversification among smallholder sugarcane growers. For example, landless households participate highly in various income generating activities than land-rich households. This suggests that diversification is associated with rural poverty. Poor households are likely to find out ways of survival by engaging in various income generating activities even if they earn lower income from those activities. This observation is consistent with Haggblade *et al.* (2010) and Reardon *et al.* (2006).

Empirical results have also shown the importance of land ownership, education of the household head, age of the household head, access to road, household size, sugarcane price and payment mechanisms and location in determining household income from multiple employment activities. Land ownership is positively correlated with farm employment activities. Household who own land is mostly involved in crop production, signifying that land is mainly used for crops. Education measured in years of schooling, indicates that those who spent more years at school have the opportunity to find out jobs

and or possibly create their own employment opportunities. This is evident by positive correlation between education and both off-farm employment and wage jobs.

As expected household size, the number of economically active family members in the household has shown positive and significant influence on farm employment income and off-farm income. The positive relationship reveals that as the number of working age family members increases, the possibility of household to earn income from these activities also increases. This entails that smallholder cane growers who have large number of economically active family members had the ability to participate in different income generating activities and earn more income from these activities than those smallholder cane growers with small number of economically active family members.

The analysis also shows that pricing and payment mechanisms in the sugarcane sector increases income from Sugarcane cultivation but reduces income from non-sugarcane farm employment and wage employment. This relationship suggests that sugarcane prices and payment modalities play great role in determining the welfare of the sugarcane outgrowers. Contribution of income from sugarcane cultivation to total household income is significant especially in Kilombero. Given the importance of sugarcane income to the households, any dissatisfaction from the way sugarcane price is determined, and/ or occurrence of any abnormalities related to payment mechanisms e.g. delay payments significantly affect participation in sugarcane cultivation and consequently to the total income of the smallholder cane growers. Such abnormalities set up entry barriers in sugarcane business, and ultimately have impacts on the households' wellbeing.

The results have shown that the overall income diversification is significant and positively correlated with asset endowments such as natural, human, physical, and financial. This is in line with the hypothesis developed from the livelihood framework. Following the importance of these determinants of diversification on households' income, land policy may play a role in this respect because as per results, the individual households need to increase land size in order to generate more farm income for realization of ongoing poverty alleviation initiatives among rural communities. Since land size matters for individuals to diversify in farm activities, there should be a policy

that permits land ownership by individuals, domestic firms and foreigners for Tanzania to realise food security and poverty alleviation.

On the other hand, farm employment incomes (non-sugarcane farm income) are not affected by education of the households. This meaning that this category of activity has been carried out traditionally despite its contribution to total households' income. In order to realise modern farming for higher incomes, efforts should be made in improving skills and knowledge of sugarcane outgrowers through provision of training.

Finally, it was noted that in the efficiency analysis (in the previous chapter) smallholder cane growers in Kilombero were more productive in sugarcane production than Turiani-smallholder cane growers. Indeed in the analysis of cases (first chapter), it was again revealed that smallholder cane growers in Turiani were offered lower prices and were paid late for their produce compared to their counterparts in Kilombero as result 86% of smallholder cane growers in Turiani have been struggling to survive by engaging in non-cane income generating activities. Since the findings in the previous chapters corroborate with this chapter, it can therefore be concluded that smallholder cane growers' participation decision in diversification of activities away from sugarcane farming was driven by low returns from cane production.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

6.1 Overview

The overall goal of this study was to assess the influence of CF on process upgrading, efficiency, and income diversification strategies among smallholder sugarcane outgrowers in Kilombero and Turiani. To achieve this objective, three specific objectives were developed and each objective was examined by its own framework. Specific objective one assessed whether CF facilitates or obstructs farmers from upgrading their production processes and identifies factors affecting process upgrading. Qualitative data used was collected from 59 respondents selected from four categories of units of analysis, that is, smallholder farmers, farm group leaders, processors, farmer associations, and government agencies using face-to-face in-depth interview through unstructured interview guide. Specific objective two analysed profit efficiency and factors affecting efficiency of smallholder farmers. Specific objective three aimed to determine the extent and intensity of income diversification among cane growers. Both objectives were analysed using quantitative data collected from randomly selected 400 cane growers using structured interview. The key inferences of the major findings are summarised in Section 6.2. Section 6.3 presents conclusion of the study; Section 6.4 presents contribution of the study to knowledge. Section 6.5 highlights policy implication; and Section 6.6 presents limitation of the study and areas for further studies.

6.2 Summary of major findings

6.2.1 Aspects of CF arrangements constraining cane growers from upgrading their processes

The first objective of this study intended to assess the role of CF on process upgrading. The findings on the incentive and capability variables have confirmed that smallholder farmers in Kilombero and Turiani were constrained by limited incentives and capabilities to undertake cane farming activities. Price of sugarcane, payment modalities, and enforcement mechanisms were considered the major constraints for the

smallholder cane growers to upgrade their production process. Price of sugarcane was considered low and unfairly determined, while payment mechanisms were based on unfairly quality determination procedures and in many occasions were paid very late. Delayed payments adversely affected cane growers' economic activities such as: underutilisation of agricultural inputs like fertilizer, pesticides, and land; and harvesting old and unmanaged sugarcane fields due to lack of financial capability. In addition, evidence from study units indicates that training, extension and credit were not part of the contract farming arrangement, and farmers were unable to secure these services at their own due to high costs involved. It is concluded that by excluding these services in the contract created many failures in crop management for the majority of smallholders' cane fields. If there is no future plan to include the aforementioned services in the contract, there is a danger of excluding farmers from the business, especially in Turiani.

6.2.2 Farm profit efficiency

Specific objective two examined profit efficiency levels and factors behind such levels. Both descriptive and model results indicate that there was large variability in terms of yields and profits among smallholder cane growers in Kilombero and Turiani. Similarly, the mean profit efficiency levels of sugarcane production was 71% and 55% for Kilombero and Turiani farms respectively, which suggested that an estimated 29% and 45% loss in profit was due to a combination of both technical and allocative inefficiencies in Kilombero and Turiani farms respectively. Profitability differences were mainly attributed to differences in the usage agricultural input and sugarcane prices. In fact neither Kilombero nor Turiani utilised fertilizer optimally on their farms, although Turiani farms exhibited extremely higher fertilizer underutilisation compared to their counterparts in Kilombero. The major significant factors explaining sugarcane farm-specific profit inefficiencies across the study areas included ownership of non-agricultural assets and part-time in sugarcane farms. Other variables such as non-cane income share and gender were sources of efficiency. None agricultural asset ownership showed positive relationship with profit efficiency, implying that households who owned more non-agricultural assets had opportunities to participate in other income generating activities thereby splitting labour and other resources among several activities

and thus leading to profit inefficiencies in sugarcane cultivation. Likewise, part-time in sugarcane cultivation increases inefficiency in Kilombero, but reduces inefficiency in Turiani. Other factors, i.e. non-cane income share and gender have negative relationship with profit efficiency, implying that both income from other activities than sugarcane cultivation and male headed households are important in realising sugarcane profitability in the study areas.

Generally, the results suggest that variable inputs especially acquisition and usage of fertilizer and fixed factors like land together with other inefficiency factors found statistically significant are important in order to improve sugarcane profitability. Consequently, policy should focus on improving access to and usage of fertilizer by smallholder cane growers in addition to the improvement in motivation factors e.g. better and timely sugarcane payments in order to encourage full-time participation in sugarcane fields.

6.2.3 Extent and intensity of income diversification

Objective three which forms chapter five of this thesis analysed the extent of household income diversification and its determinants. Descriptive result indicates that 284 cane growers (71%) of 400 surveyed in the study area were engaged in different income generating activities. Similarly, participation rate was higher in Turiani (86%) than in Kilombero (55%). Highest participation was found in non-cane farm activities in both areas, and it was the most important source of income in Turiani by contributing about 42% of cane growers' total income. In addition, contribution of farm employment income was high for about 81% for land rich farmers while sugarcane income contributed only 13% of the total land rich household income in Turiani.

In Kilombero, the most important income generating activity was sugarcane cultivation which contributed 47% of cane grower's total income, and its importance increases with increase in landholdings, by contributing about 72% of the land rich farmers' income while farm activities other than sugarcane contribute 25% of the total land rich farmers' income. Off farm employment income was ranked the second in both areas, although its importance decreases with increase in land holdings.

Concerning determinants of diversification by income source, Tobit MLE results indicate that farm employment income was positively influenced by land ownership and household size, and negatively influenced by sugarcane price and payment mechanisms. Likewise, off farm employment was influenced positively by household size, education, and sugarcane price and payment mechanisms; and negatively by the age of the household head. Wage employment income is positively influenced by education and access to infrastructure, and negatively by the age of the household head. In general, sugarcane price and payment mechanisms seem to have impacts on both farm and off farm employment incomes implying that these factors were important determinant factors of participation in farm and off farm activities.

Pertaining to the overall income diversification strategy, Shannon equitability index shows that the overall diversification was higher in Turiani than in Kilombero based on the values of the Shannon equitability index of 70.3% and 55% for Turiani and Kilombero respectively. The major significant factors explaining the overall diversification include size of land owned, access to paved road, education, and household size which were all positively correlated with Shannon equitability index.

Generally, the results denote that land ownership and household characteristics (education level of household head, age and household size) enabled smallholders to diversify in various income generating activities, whereas access to road, price and payment mechanisms provided households motivation to participation in various income sources. Policy should focus on improving access to land, education, paved road and better price and payment modalities in order to realize improved livelihoods for poverty reduction among rural households in general.

6.3 Conclusions

The conclusions in this section are based on the specific objectives established at the outset of this thesis. This study has revealed that CF arrangements in the study area do not provide agricultural inputs, extension, training, and research services contrary to what was expected, although these services are crucial in creating capability for enhancing competitiveness of smallholder farmers in their production processes.

Furthermore, it was realised that price of sugarcane and payment modalities under CF decreases incentives for farmers to actively participate in the business. It is concluded that CF arrangement needs intervention in order to develop intergraded organisation that would expand producer capabilities and incentives to supply sugarcane.

Profit efficiency analysis also indicated that smallholder farmers operated far below profit frontier due to existence of inefficiencies influenced by lack of commitment in sugarcane cultivation as result of demotivating pricing and payment mechanisms. This study concludes that it is possible to improve efficiency of farmers by motivating them to commit their meager resources into sugarcane production by improving pricing and payment of sugarcane yields in the study areas. Likewise, income diversification was high among resource constrained households and those experienced clumsy management of contractual arrangement. This typically meant that diversification in the study areas was associated with vulnerability. In terms of incomes, largest contribution to total cane grower's income in Kilombero was from sugarcane cultivation, but for Turiani larger contribution was from non-cane farm and off farm employment activities.

In general, the study concludes that smallholder sugarcane producers lacked capabilities and incentives to embark on sugarcane production which made them become inefficient. Ultimately, they were involved in diversification to reduce vulnerability. Similarly, price and payment mechanisms determined significantly process upgrading, farm profitability, and the levels of diversification by income source across households in the study areas. Therefore, sugarcane price and payment mechanisms or simply market access should be considered as important factor towards improvement of household income for poverty reduction among small scale sugarcane producers.

6.4 Contribution of the study to knowledge

This study was based on the existing debate in the literature regarding the role of CF arrangements in improving smallholder farmers' performance for poverty reduction. Many studies have been conducted to establish relationship between CF and farmers' performance and welfare. Some of these studies have successfully established such relationship by treating CF as a binary explanatory variable. That is they considered CF

as a package neglecting variation in practicing terms-based contract as variables to be explored and explained. Treating CF as a binary variable may lead to policy implication focusing on increasing CF participation, hence failing to identify specific and critical motivating factors of CF participation needed to well inform the policy. This study augments the previous studies by unpacking the CF “envelop” and evaluating the influence of CF on farm’s performance using the terms available therein as explanatory variables. Hence, adding knowledge concerning methodological approach for non-experimental studies which assess the influence of CF on performance.

Furthermore, this study contributes to knowledge through its methodological approach regarding measurement of farm’s performance. Unlike previous studies conducted in Tanzania, particularly in the sugar sector, which have evaluated farm’s performance focusing on estimating technical efficiency using traditional production function. Such approach does not take into consideration other inefficiency components related to the issues of product quality. This study has evaluated farm’s performance using normalised profit function to estimate profit efficiency which captures inefficiency components related to quality of the product due to the fact that sugarcane value is determined by its quality. Hence, using profit approach leads to the policy implication which focuses on improving both technical and allocative inefficiencies. Similarly, with regard to the specific objective three which was established based on the existing debate within the diversification literature, where some studies view diversification as a livelihood strategy mainly meant for asset accumulation. While other studies claim that diversification is a result of vulnerability such as economic turndown, insecurity and other shocks. This study adds to this debate by arguing that income diversification in the study areas was associated with vulnerability resulted from unsuccessful CF arrangement introduced as an intervention after privatisation in the sugar sector in Tanzania. This study goes a step ahead by further arguing that diversification in the study areas was mainly dominated by low income generating activities. This means that diversification born of desperation generally involves low income generating activities since access to high return activities would normally require more resource endowments.

Similarly, the finding from this study has reported the importance but missing market for sugarcane yields in terms of pricing, payment and harvesting operations in the study areas. Such knowledge may create awareness to policy makers and other stakeholders when designing initiatives aiming at improving outgrowers' performance in the sugar sector and other sectors in the economy. For example, the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) initiative currently inaugurated in Tanzania to maximise returns by simulating high production in sugarcane and other commodities through four main priorities: infrastructure development; training and financing outgrowers; support in start-up and operations; and private coordination, can find this information useful if the aim is to proliferate growers' livelihoods. Because SAGCOT initiative is typically based on capacity building, its implementation needs to include the incentive component that is access to reliable and remunerative market for the yields. The role of the market as an incentive was identified in this study as the major drawback for the majority of the smallholder farmers in participating efficiently in sugarcane production.

6.5 Overall policy implications

The findings from the qualitative analysis and empirical results highlighted in this thesis lead to the following policy conclusion. First, it appears that there remains a lot of scope for improving sugarcane profitability among cane growers if improvement in both technical and allocative inefficiencies is made. Such improvement should focus on capability and incentive parameters such as access to input and input usage, land, and market. Regarding fertilizer use, there is a need to introduce sensitisation programmes regarding resource use and management among smallholder cane growers in the study areas to help them abandon the traditional farming practices. It is also recommended that there should be political wills in making and implementing policies that would facilitate an increase of farmers' ability to secure timely essential agricultural services to support in their production process.

Second, evidence from the study findings indicate that research, training and extension services play crucial role in creating capacity and thus enhancing competitiveness and sustainability of the smallholder farmers and sugar industry in general. Unfortunately,

these services are not included in the CF package in the study area. Similarly, it was noted that price of sugarcane and payment mechanisms decreases incentives for farmers to actively participate in the business. Therefore, in order to improve farmers' capabilities and incentives to participate in sugarcane production, there is a need to develop integrated interventions which may include (1) the need to capitalised fully on the research and training institutions formerly established in the country purposely for sugar sector development by providing sufficient resources for conducting research and training on matters aimed at strengthening capacity of the outgrowers, promoting good cane husbandry skills and techniques related to the development of sugar industry; (2) the need to intervene CF arrangement to ensure that the state in collaboration with other stakeholders such as NGOs, CBOs oversee the prices of both output and agro-input by setting indicative prices similar to what has been happening in other crops like cotton and tobacco. (3) The current CF under review by the Ministry of Agriculture, Food and Cooperatives should deliberately incorporate clauses that give smallholder farmers negotiation powers unlike the existing CF which has treated marginally the important stakeholders such as farmers, farmer group leaders and association leading to the lack of influence over the agreement. (4) There is a need to introduce and review incentive policies and regulations to attract and retain small and larger farmers' investments in sugarcane subsector by creating alternative markets of their produce. This could be done by amending the Sugar Act 2001 to allow establishment of supplementary factories around the existing ones. Such measures could help solve the pricing and payment mechanisms including enforcement problems and reduce excessive powers vested to processors in the overall processes of contract negotiation and execution currently affecting smallholder farmers' performance and upgrading in general.

6.6 Areas for further research

Findings presented in this thesis can be extended and add new knowledge by conducting further research in the areas suggested hereunder.

1. When investigating factors influencing profit efficiency in the study area, further work is required to capture the impact of farm soil conditions as well as land fragmentation based on plot size rather than using aggregated land size. Such

information is crucial for policy makers and extension agents for reducing farm inefficiency levels in sugarcane farming in the study areas characterized by small scale and scattered plots.

2. The current study used cross sectional data which could not suffice to construct pattern of profit efficiency indices which could help to establish argument on the role of CF adoption on farm profitability across seasons. Thus, to give more clarity of the impact of CF on profit efficiency, additional study is required to establish such argument by employing seasonal or panel data.
3. Equally, further work is required to capture the extent of diversification by constructing the pattern of livelihood diversification indices using panel data in order to detect the importance and direction of livelihood diversification strategies among cane growers in the study area.

REFERENCES

- Adamu, T. and Bakari, U.M. (2015). Profit Efficiency among Rain-Fed Rice Farmers in Northern Taraba State, Nigeria. *Journal of Biology, Agriculture and Healthcare*, 5(8): 113-119.
- Admassie, A. and Matambalya, F. A. S. T. (2002). Technical efficiency of small and medium scale enterprise: evidence from a survey of enterprises in Tanzania. *EASSRL*, XVIII (2): 1-29.
- Aigner, D.J., Lovell, C.A.K., and Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6: 21-37.
- Ansah, I.G.K., Oduro, H., and Osae, A.L. (2014). A Comparative Analysis of Profit Efficiency in Maize and Cowpea Production in the Ejura Sekyedumase District of the Ashanti Region, Ghana. *Research in Applied Economics*, 4(6): 106-125.
- Atkinson, S.E. and Halvorsen, R. (1980). A test of relative and absolute price efficiency in regulated utilities. *Review of Economics and Statistics* 62(1): 81-88.
- Banerjee, A. et al. (2003). Contract farming. *Economic and Political Weekly*, vol. 38(20): 1910.
- Bardhan, P. and Mokherjee, D. (2011). Subsidised farm input program and agricultural performance: A farm level analysis of West Bengal's green revolution 1982-1995. *Revised version*: February, 2011.
- Barrett, C.B., Bachke, M.E., Bellemare, M., Michelson, H.C., Narayanan, S., and Walker, T. (2012). Smallholders' participation in contract farming: comparative evidence from five countries. *World Development*, 40(4): 715-730.
- Barrett, C.B. and Reardon, T. (2000). Asset, activity, income diversification among African Agriculturalists: some practical issues. Project report to the USAID BASIS CRSP.

- Barret, C.B., Reardon, T., and Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy*, 26(4): 315-331
- Battese, G.E. (1996). On the estimation of production functions involving explanatory variables which have zero values. No 86, University of New England, Armidale.
- Battese, G.E. (1997). A note on the estimation of Cobb-Douglas production function when some explanatory variables have zero values. *Journal of Agricultural Economics*, 48(2): 250-252.
- Bellemare, M.F. (2012). As you sow, so shall you reap: the welfare impacts of contract farming. *World Development*, 40(7): 1418-1434.
- Bernsten, H. and Campling, L. (2006). Commodity studies and commodity fetishism I: trading down. *Journal of Agrarian Change*, 6(2): 239-264.
- Bienabe, E., Coronel, C., LeCoq, J. and Liagre, L. (2004). Linking smallholder farmer to markets: lessons learned from literature review and analytical review of selected projects. Final Report, World Bank.
- Bijman, J. (2008). *Contract farming in developing countries: an overview* (working paper). Wageningen University, Department of Business Administration, Hollandseweg 1, The Netherlands.
- Bijman, J. and Wollni, W. (2008). Producer organisations and vertical coordination: an economic organisation theory perspective. Wageningen University economics group, The Netherlands.
- Bogetoft, R. and Olesen, H.B. (2004). *Design of production contracts: lessons from theory and agriculture*. Copenhagen Business School Press, 1st Ed.
- Bolwig, S., Gibbon, P. and Jones, J. (2009). The Economics of Smallholder Organic Contract Farming in Tropical Africa. *World Development* 37(6): 1094 – 1104.

- Borenstein, M., Rothstein, H., and Cohen, J. (1997). Power and precision, Bio-stat, Teaneck NJ software for MS-DOS system.
- Borenstein, M., Rothstein, H., and Cohen, J. (2001). *Power and precision*, Biostat, Inc. 14 North Dean Street, Englewood, USA.
- Cechura, L. (2010). Estimation of technical efficiency in Czech agriculture with respect to firm heterogeneity. *Journal of Agricultural Economics – Czech*, 56(4): 183-191.
- Chow, S., Shao, J., and Wang, H. (2010). *Sample size calculation in clinical research*. (2nd Ed), Taylor and Francis Group, LLC, USA.
- Christiaensen, L., Demery, L., and Kuhl, J. (2006). *The role of agriculture in poverty reduction: An empirical perspective* (working paper series No.4013). World Bank.
- Chry, S.Y., Taylor, G., and Huic, L.P. (2008). Transition from OEM to OBEM: A case study of Fenix. *RJTA* 12(3): 77-85.
- Coase, R. H. (1937). The nature of the firm. *Econometrica*, Nov. 1937(4): 386-405.
- Cooke, P. and Morgan, K. (1998). The associational economy: firms, regions and innovation, Oxford: Oxford University press.
- Corral, L. and Reardon, T. (2001). Rural nonfarm incomes in Nicaragua. *World Development*, 29: 427-442.
- Covarrubias, K., Nsiima, L. and Sezza, A. (2012). Livestock and livelihoods in rural Tanzania: A descriptive analysis of the 2009 National Panel Survey. Joint Paper for the World Bank, Fao, AU-IBAR, ILRI and the Tanzania Ministry of Livestock and Fisheries, LSM-ISA.
- Daniel, J. (2012). *Sampling Essentials: Practical Guidelines for Making Sampling Choices*. SAGE Publications Inc.

- Da Silva, C. (2005). The growth role of contract farming in agrifood systems development drivers: theory and practice. *Working document, Agricultural Management and Finance Services*, FAO, Rome.
- Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quinones, E., Zezza, A., Stamoulis, K., Azzarri, C. & DiGiuseppe, S. (2010). A cross country comparison of rural income generating activities. *World development*, 38 (1): 48-63.
- Dawes, M., Murota, R., Jera, C., Masara, C., and Sola, P. (2009). Inventory for smallholder contract farming practices in Zimbabwe: support capacity for enhanced market access and Knowledge management. SNV Netherlands Development Organisation, revised final report, December.
- De Battisti, A., MacGregor, J., Graffham, A. (2009). *Standard bearers: horticultural exports and private standards in Africa*. London: IIED. De Janvry, A., Sadoulet, E. and Zhu, N. (2005). The role of nonfarm income in reducing poverty and inequality in China. CUDARE working paper No. 1001. Berkeley: University of California.
- Demissie, A. and Legesse, B. (2013). Determinants of diversification among rural households: The case of smallholder farmers in Fedis district, Eastern hararghe zone, Ethiopia. *Journal of Development and Agricultural Economics*, 5(3): 120-128.
- Demurger, S., Fournier, M. and Yang, W. (2010). Rural household decisions towards income diversification: evidence from a township in Northern China. *China Economic Review*, 21: 532-544.
- Diao, X., Hazell, P., Resnick, D., and Thurlow, J. (2007). *The role of agriculture in development: Implication for Sub-Saharan Africa*. (Research Report No. 153), International Food Policy Research Institute (IFPRI), Washington DC, USA.
- Diao, X., Hazell, P., and Thurlow, J. (2010). The role of agriculture in African development. *World Development* (2010), doi:10.1016/j.worlddev.2009.06.011

- Dixon, J., Gulliver, A., and Gibbon, D. (2001). *Farming Systems and Poverty: Improving farmers' livelihoods in a changing world*. Malcolm Hall, FAO and World Bank, Rome and Washington DC.
- Dolan, C. and Humphrey, J. (2001). Governance and trade in fresh vegetables: the impact of UK supermarkets on the African Horticulture Industry. *Journal of Development Studies*, 37(2): 147-176.
- Eaton, C. and Shepherd, A.W. (2001). "A guide, contract farming-partnership for growth". *FAO Agricultural services bulletin*, 145: 1-182.
- Elashoff, J. (2000). nQuery Advisor Release 4.0 statistical solutions, software for MS DOS systems, Cork, Ireland.
- Ellis, F. (1993). *Peasant Economics: Farm Households and Agrarian Development* (2nd Ed). Cambridge University Press.
- Ellis, F. (1998). Survey article: household strategies and rural household diversification in developing countries. *Journal of Agricultural Economics*, 51(2): 289-301.
- Ellis, F. (2003). A livelihoods approach to migration and poverty reduction. Pap commissioned by the Department of International Development (DFID). Contract No. CNTTR 03 4890.
- Ellis, F. and Mdoe, N. (2003). Livelihoods and rural poverty reduction in Tanzania. *World Development*, 31(8): 1384-2003.
- Emongor, A.R., Louw, A., Kirsten, F.J. and Madevu, H. (2004). *Re-governing markets: sourcing small producers' participation in restructured national and regional agri-food system*. (Zambia Country Report' Prepared for International Institute for Environment and Development (IIED) London), Department of Agricultural Economics, August 2004.
- Escobal, J. (2001). The determinants of nonfarm income diversification in rural Peru. *World Development*, 29(3): 497-508.

- Eyhorn, F., Mader, P. and Ramakrishnan, M. (2005) The Impact of Organic Cotton on the Livelihoods of Smallholders. FiBL research report. Frick: Research Institute of Organic Agriculture.
- FAO (2011). FAOSTAT agriculture country profiles. (Available at: www.fao.org/countryprofiles/index/en/?iso3=Tza)
- FAO (2013). Farm extension guide: The role of the farm management specialist I extension. Food and Agriculture Organisation of the United Nations, Rome.
- Farrell, J.M. (1957). The measurement of productive efficiency. *Journal of Royal Stats* 506, 120(III): 253-290.
- Fernandez-Cornejo, J. (2007). Off-farm income, technology adoption, and farm economic performance. Economic Research Report No. 30, United States Department of Agriculture.
- Fernandez, M.D.P. and Nutball, P.L. (2009). Technical efficiency in the production of sugarcane in central Negros area, Philippines: an application of data envelopment analysis. Lincoln University, Canterbury-New Zealand.
- Gereffi, G. (1999). International Trade and Industrial Upgrading in the Apparel Commodity Chain. *Journal of International Economics* 48(1): 37 – 70.
- Gereffi, G., Humphrey, J. and Sturgeon, T. (2005). The governance of global value chain. *Review of International Political Economy*, 12(1): 78-104.
- Gibbon, P. (2001). Upgrading primary production: a global commodity chain approach. *World Development*, 29(2): 345-363.
- Gibbon, P. (2003). *Commodities, donors and value chain analysis and upgrading*. DIIS. Paper Prepared for UNCTAD.
- Gibbon, P., Ponte, S. (2005). *Trading down: Africa, value chains, and the global economy*. Philadelphia Temple University Press.

- Graffham, A., Karehu, E., and MacGregor, J. (2007). Impact of EurepGAP on small scale vegetable growers in Kenya. *Fresh Insights* No. 6. September. Retrieved August 15, 2012 from the World Wide Web: <http://www.dfi.d.gov.ukR4D/PDF/Outputs/EcoDev/60506freshinsights6EurepGapKenya.pdf>
- Greenway, D. and Kneller, R. (2007). Firm heterogeneity, exporting and foreign direct investment. *Economic Journal*, 117(517): F134-F161, 1.
- Grosh, B. (1994). Contract Farming in Africa: an Application of the New Institutional Economics. *Journal of African Economies* 3(2): 231 – 261.
- Guo, H. (2005). Analysis of the influencing factors of Chinese farmers' participation in contract farming. *Chinese Rural Economy*, 3. 24-32.
- Guo, H., and Jolly, R.W. (2009, August). Contract farming in China: Perspectives of smallholder. Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China.
- Haggblade, S., Hazell, P.B.R. and Reardon, T. (2007). *Transforming the rural non-farm economy: opportunities and threats in the developing world*. Baltimore, Maryland: The Johns Hopkins University Press.
- Hart, G. (1994). The dynamics of diversification in an Asian rice region. In S. Demurger and M. Fournier; rural households' decisions towards income diversification: evidence from a township in Northern China. *China economic review* 21: 532-544.
- Hazell, P., Poulton, C., Wiggins, S. and Dorward, A. (2010). The future of small farms. *World Development*, 38(10): 1349-1361.
- Higgs, A.J. and Muchow, R.C. (2003). Assessing the potential benefits of alternative cane supply arrangement in the Australian sugar industry. *Agricultural Systems* 76: 623-638.

- Hoening, J. M. and Heisey, D. M. (2001). The abuse of power: the pervasive fallacy of power calculations for data analysis. *The American Statistician*, 55(1): 1-6.
- Howlett, D. (2001, June). Note on the sustainable livelihoods approach to development. Paper presented at the Niger Delta Environmental Managers Training Programme, Morogoro, Tanzania.
- Humphrey, J. (2003). Opportunities for MSEs in developing countries to upgrade in a global economy. *ILO Working Paper No.43*, Geneva.
- Humphrey, J. (2004). Upgrading in global value chains. *ILO Working Paper No. 28*, Geneva.
- Humphrey, J. (2005). Shaping value chain for development: global value chains in Agribusiness. *Trade Programme, Sectoral Project agriculture Trade*. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Eschborn, Germany, May 2005.
- Humphrey, J. (2006). *Global Value Chain in Agrifood sector*. Working paper: UNIDO Strategic Research and Economic Branch: UNIDO.
- Humphrey, J. and Memodovic, O. (2006). *Global value chains in the agri-food sector*. Working Paper, United Nations Industrial development Organisation
- Humphrey, J., and Schmitz, H. (2002). How does Insertion in Global value Chain Affect Upgrading in Industrial Clusters? *Regional Studies* 36(9): 1017 – 1027.
- Idiong, I.C. (2007). Estimation of farm level technical efficiency in small scale swamp rice production in cross river state of Nigeria: a stochastic frontier approach. *Journal of Agricultural Sciences*, 3(50): 653-658.
- IFPRI, (2012). Increasing agricultural productivity and enhancing food security in Africa: new challenges and opportunities. *Synopsis of an international conference*, International Food Policy Research Institute, Washington DC.
- Jacobson, M. (2010). Contract farming, livelihoods and development in Africa. School of Economics and Management, Lund University.

- Jayne, T.S., Mason, N., Myers, R., Ferris, J., Mather, D., Beaver, M., Lenski, N., Chapoto, A., and Boughton, D. (2010). Patterns and trends in food staples markets in Eastern and Southern Africa: Towards the identification of priority investments and strategies for developing markets and promoting smallholder productivity growth”, Michigan State University.
- Jayne, T.S., Mather, D., and Mghenyi, E. (2010). Principal challenges confronting smallholder agriculture in Sub-Saharan Africa. *World Development*, 38(10): 1384-1398
- Kadigi, M.J., Mdoe, N.S.Y., senkondo, E. and Mpenda, Z. (2007) Effect of Food Safety Standards on the Livelihoods of Actors in the Nile Perch Value chain in Tanzania?. Working Paper 2007/24, Copenhagen: Danish Institute of International studies.
- Kamuzora, A. K. N. (2010). Contractual governance in agro-industry institutions in Tanzania: a case study analysis. Unpublished doctoral dissertation, University of Groningen.
- Kaplinsky, R. and Morris, M. (2008) Value Chain Analysis: A tool for enhancing Export Supply Policies. *International Journal of Technology Learning* 1(3): 283 – 308.
- Key, N. and Runsten, D. (1999). Contract farming, smallholders, and rural development in Latin America: the organisation of agro-processing firms and the scale of outgrower production. *World Development*, vol. 27(2): 381-401.
- Kolawole, O. (2006). Determinants of profit efficiency among small scale ice farmers in Nigeria: a profit function approach. Poster paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia
- Kroes, S. and Fadden, J.M. (2004). A proposed cane payment for Fidii. *Proceedings of the Australian Society of Sugarcane Technologists*, 26: 1-12.

- Kumar, J. (2006). Contract farming through agribusiness and State Corporation: A case study of Punjab. *Economic and Political Weekly*, 41.
- Kumar, R. (2005). *Research Methodology: A step-by-step guide for beginners* (2nd Ed.), New Delhi: Pearson Education. .Kumar, J. and Kumar, P.K. (2008). Contract farming: problems, prospects, and effects on income and employment. *Agricultural Economics Research Review*, 21: 243- 250.
- Kumbhakar, S.C. (1994). Efficiency estimation in a profit maximizing model using flexible production function. *Agricultural Economics*, 10: 143-152.
- Kumbhakar, S.C. (1996). A parametric approach to efficiency measurement using flexible profit function. *Southern Economic Journal*, 63(2): 473-487.
- Kumbhakar, S.C. and Bhattacharyya, A. (1980). Price distortion and resource use efficiency in Indian Agriculture: a restricted profit function approach. *Review of Economics and Statistics*, 74(2): 231-239.
- Kumbhakar, S.C. and Lovell, C.A.K. (2000). *Stochastic Frontier Analysis*. Cambridge: Cambridge University Press.
- Le Gal, G.Y, Papaiconomou, H., Lyne, P. and Meyele, M.L. (2008). Impact of alternative relative cane payment systems and harvest scheduling on growers' revenues. *Proc S Afr Sug Technol Ass*, 79:417.
- Lejars, C., Le Gal, P.Y., Meyer, E., Lyne, P., Auzoux, S. and Siegmund, B. (2005). Improved profitability by reorganising mill supply: a decision support approach. *Proceedings of ISSCT*, 25(2): 20-24.
- Lejars, C., Le Gal, P.Y. and Auzoux, S. (2008). A decision support approach for cane supply management within a sugar mill area. *Computer and Electronics in Agriculture*, 60(2): 239-249.
- Lejars, C., Auzoux, S., Siegmund, B., and Letouemy, P. (2010). Implementing sugarcane quality-based payment systems using a decision support system. *Computers and Electronics in Agriculture*, 70: 225-233.

- Lengh, V.L. (2001). Some practical guidelines for effective sample size determination. *American Statistician*, 55(3): 187-193.
- Lie, H., Rich, K. M., Kurwijila, L. R., and Jervell, A. M. (2012). Improving smallholder livelihoods through local value chain development: A case study of Goat Milk Yogurt in Tanzania. *The International Food and Agribusiness Management Review*, 15(3): 55-86.
- Little, P.D. and Watts, M.J. (1994). "Living under contract: contract farming and agrarian transformation in Sub Saharan Africa". Madison, University of Wisconsin Press.
- Long, V.H. and Yabe, M. (2012). Impact of Environmental Factors on the Profit Efficiency of Rice Production: A Study in Vietnam's Red River Delta. *Global Journal of Human Social Science Geography & Environmental Geo Sciences*, 12(9): 15-22
- M4P, (2005). Linking farmers to markets through contract farming. *Proceedings for an M4P/ An Giang University Workshop: 27-34.*
- Magingxa, L. L. and Kamara, A. B. (2003, October). Institutional perspective of enhancing smallholder market access in South Africa. Contributed paper presented at the Annual Conference of the Agricultural Economics Association (AEASA), Pretoria, South Africa.
- Man, N. and Ndawi, N.M. (2010). The practices of contract farming among fresh fruit and vegetable suppliers in Malaysia. *American Journal of Agricultural and Biological Sciences* 5(3): 321-330.
- Masakule, O. and Henson, S. (2005). Why do small scale producers choose to produce under contract? Lessons from non-traditional vegetable exports from Zimbabwe. *World Development* 33: 1721-1733.
- Masuku, M.B. (2011). Determinants of sugarcane profitability: the case of smallholder cane growers in Swaziland. *Asian Journal of Agricultural Sciences*, 3(3): 210-214.

- Matango, R. (2006). Mtibwa outgrowers' scheme: a model for smallholder cane production in Tanzania. *United Nations Conference on Trade and development*. UN, New York.
- Meeusen, W. and Van den Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed errors. *International Economic Review*, 18: 435-444.
- Meyer, (2008). Background paper "context of agricultural technologies for developing countries". Institute of Technology Assessment and Systems Analysis, ITAS, Karlsruhe.
- Minot, N. (2007). Contract farming in developing countries: Patterns, impact and policy implications. Cornell University Library. <http://cip.cornell.edu/dns.gfs/1200428173>
- Minot, N. and Ngigi, M. (2004). *Are horticultural exports a replicable success story? Evidence from Kenya and Ivory Coast*. EPTD Discussion Paper No. 120 and MTID Discussion Paper No. 73. Environment and Production Technology Division and Markets Trade and Institutions Division, International Food Policy Research Institute, Washington DC, August.
- Minten, B., Randrianarison, L., and Swinnen, J.F.M. (2009). Global retail chains and poor farmers: evidence from Madagascar". *World Development*, vol. 37(11): 1728-1741.
- Mitchell, J., Keane, J. and Coles, C. (2009). Trading Up: How a Value Chain Approach can benefit the Rural Poor. COPLA Global: Overseas Development Institute.
- Miyata, S., Minot, N., and Hu, D. (2009). Impact of contract farming on income: linking small farmers, packers, and supermarkets in China. *World Development*, 37(11): 1790-2009.

- MOA Cane Supply Agreement (2011). Cane Supply Agreement between Mtibwa Outgrowers Association (MOA) and Mtibwa Sugar Estates Ltd., from 2009 - 2012. Turiani, Morogoro.
- Moor, G.M. (2002). Enhancing cane quality incentives in the South African sugar industry: the recoverable value (RV) cane payment system. *Farming for RV Workshop*, South African Sugar Technologists' Association. Mount Edgecombe, South Africa, 18pp.
- Morogoro Regional Profile (2008). Stakeholders' mapping-postharvest innovation platform. Consultancy Report for Ulanga, Kilombero, Kilosa, and Mvomero districts, Morogoro, Tanzania.
- MSEL and MOA-MoU (2012). Records for negotiations between MSE and MOA, TUCOCPRICOS and KIOMA on cane price for the season 2012/13. Morogoro Hotel, May 2012.
- Msuya, E. E. and Ashimogo, G. (2005). Estimation of technical efficiency in Tanzania sugarcane production: a case study of Mtibwa Sugar Estate Outgrowers Scheme. Online at <http://mpa.ub.uni-muenchen.de/3747/MPRA Paper No.374>.
- Msuya, E. E., Hisano, S., and Nairu, 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
- Murray, T. (2002). Derivation of the RVE formula. *Farming for RV Workshop*, South African Sugar Technologists' Association. Mount Edgecombe, South Africa, 18pp.
- Musara, J.P., Zivenge, E., Chagwiza, G., Chimvurahwe, J. and Dube, P. (2011). Determinants of smallholder cotton contract farming participation in recovering economy: empirical results from Patchway District Zimbabwe. *Journal of Sustainable Development in Africa*, 13(4): 1-12.

- Navas-Aleman, T. (2011). The impact of operating in multiple value chain for upgrading: the case of Brazilian Furniture and Footwear Industries. *World Development*, 39(8): 1386-1397.
- Naved, R.T. (2000) Intra-household Impact of the Transfer of Modern Agricultural Technology: A gender perspective'. Food Consumption and Nutrition Division discussion paper 85. Washington, DC: international Food Policy Research Institute.
- Ngaiza, R.S. (2012). Integrated policy approach to commercializing smallholder maize production in Tanzania. Paper presented at the FAO regional workshop, University of Nairobi, Nairobi, Kenya.
- Nghiem, L.T. (2010). Activity and income diversification: trends, determinants and effects on poverty reduction. The case of the Mekong River Delta. Unpublished doctoral dissertation, Erasmus University, Rotterdam.
- Nkonya, N. and Barreiro-Hurle, J. (2012). Analysis of incentives and disincentives for sugar in the United Republic of Tanzania. Technical notes series, MAFAP, FAO, Rome.
- Nkya, E. J. (2003). Institutional barriers to small scale business development: a need for flexibility in Tanzanian tax and regulation systems. *The Journal of Entrepreneurship*, 12(1): 43-73.
- Nkya, E.J. (2005). Estimating and comparing transaction costs in formal and informal small scale enterprises: Food vending enterprises in Morogoro and Ilala Municipalities in Tanzania. *AICAD Research Abstracts*, 3: 96-97.
- Nazir, A., Jariko, G.A. and Junejo, M.A. (2013). Factors affecting sugarcane production in Pakistan. *Pakistan Journal of Commerce and Social Sciences*, 7(1): 128-140.
- Oya, C. (2012). Contract farming in Sub Saharan Africa: A survey of approaches, debates and issues. *Journal of Agrarian Change*, vol. 12(1): 1-33.

- OECD, (2012). Sustainable agricultural productivity growth and bridging the gap for small family farms. *Interagency Report to the Mexican G20 Presidency*, June 201.
- O'Connor, H. and Gibson, N. (2006). Step-by-step guide to qualitative data analysis. A *Journal of Aboriginal and Indigenous Community health*, 1(1): 63-90.
- Ogunniyi, L. T. (2011). Profit efficiency among maize producers in Oyo State, Nigeria. *ARPJ Journal of Agricultural and Biological Science*, 6(11); 11-17.
- Oladeebo, J.O. and Oluwaranti, A.S. (2012). Profit efficiency among cassava producers: empirical evidence from south western Nigeria. *Journal of Agricultural Economics and Development*, 1(2): 46-52.
- Patton, M. Q. (2001). *Qualitative Evaluation and Research Methods*, (3rd ed.). Newbury Park, CA: Sage Publications Inc.
- Pauw, K. and Thurlow, J. (2010). Agricultural growth, poverty, and nutrition in Tanzania. IFPRI Discussion Paper No. 00947. International Food Policy research Institute.
- Ponte, S. (2009). Governing through quality: conventions and supply relations in the value chain for South African wine. *Sociologia Ruralis*, 49, *in press*.
- Poulton, C.D., Dorward, A.R. and Kydd, J.G. (2005). The future of small farms: new direction for services, Institutions and Intermediation. *Paper presented at the Future of Small Farms*. Imperial College, London. International Food Policy Research Institute (IFPRI).
- Prowse, M. (2012). Contract farming in developing countries – A review. ADF's Research Development. <http://researches.afd.fr>
- Rabobank, (2013). Foreign investors need enabling environment: Tanzania Sugar. Rabobank Industry Note No. 386.
- Rahman, s. (2003). Profit efficiency among Bangladesh rice farmers. *Food Policy*, 28: 487-503.

- Ravallion, M. and Chen, S. (2007). Uneven progress against poverty. *Journal of Development Economics*, 82: 1-42.
- Reardon, T. (1997). Using evidence of household income diversification to inform study of the rural non-farm labour market in Africa. *World Development*, 25(5): 735-747.
- Reardon, T. and Barrett, C.B. (2000). Agro-industrialisation, globalisation, and international development: an overview of issues, patterns, and determinants. *Agricultural Economics*, 23(3): 195-205.
- Reardon, T., Berdegue, J., Barrett, C. B. and Stamoulis, K. (2006). *Household Income Diversification into Rural Non-farm Activities*. Baltimore: Johns Hopkins University Press.
- Reardon, T., Berdegue, J. and Escobar, G. (2001). Rural nonfarm employment and incomes in Latin America: Overview and policy implication. *World Development*, 29(3): 395-409.
- Rehber, E. (2007). *Contract farming: theory and practice*. ICFAI University Press, Hyderabad, India
- Rosegrant, M.W. and Hazell, P.B.R. (2000). "Transformation of the rural Asian economy: the unfinished revolution". Hong Kong: Oxford University Press.
- SAGCOT, (2012, November). Opportunities for investors in the rice and sugar sectors. Paper presented to the Tanzania Agribusiness Investment Showcase Event, Dar Es Salaam, Tanzania.
- Sanginga, C. S., Best, R., Chitsike, C., Delve, R., Kaaria, S., and Krikby, R. (2004). Linking farmers with markets in East Africa: Empowering mountain communities to identify market opportunities and develop rural agro enterprises. *Mountain Research and Development*, 24(4): 288-291.

- Sartorius, K. and Kirsten, J. (2005). The boundaries of the firm: why do sugarcane producers outsource sugarcane production? *Management of Accounting Research*, 16:81-99.
- Savris, A., Savastano, S. and Kirsten, J. (2006). The role of agriculture in reducing poverty in Tanzania: A household perspective from rural Kilimanjaro and Ruvuma. FAO Commodity and Trade Policy Research Working Paper No. 19.
- SBT, (2011). Information to Fair Competition Commission on matters related to competition and protection of the interest of consumers of sugar in the country, Dar Es Salaam, Tanzania
- SBT, (2014). Production data: Sugar production for 2002/03 – 2013/14. Available at www.stb.go.tz/index.php/production-datas. Accessed 23rd May, 2014
- Schwarze, S. and Zeller, M. (2005). Income diversification of rural households in Central Sulawesi, Indonesia. *Quarterly Journal of International Agriculture*, 44(1): 61-73.
- Scott, A.J. (1996). Regional motors of the global economy. *Futures*, 28:391-411.
- Setboonsarng, S. Leung, P. and Stefan, A. (2008). Rice contract farming in Lao PDR: moving from substance to commercial agriculture. *ADB Discussion Paper*, No 90, Asian Development Bank Institute, Tokyo.
- Sharma, N. and Singh, S. P. (2013). Agricultural diversification and contract farming in Punjab. *Journal of Economic and Social development*, IX (1): 38-51.
- Shi, X., Heerink, N. and Qu, F. (2007). Choices between different off farm employment sub-categories: an empirical analysis for Jiangxi Province, China. *China Economic Review*, 18: 438-455
- Singh, G. and Asokan, S.R. (2005). Contract farming in India: *Text and cases*, Oxford & IBH, New Delhi.

- Singh, S. (2005). Contract farming for agricultural development: review of theory and practice with special reference to India. *Centre for Management in Agriculture*, Indian Institute of Management, Ahmedabad.
- Singh, S. (2008). Understanding practice of contract farming in India: A small producer perspective. Working Paper, CMA, IIM, Ahmedabad.
- Sivramkrishna, S., Jyotish, A. (2008). Monopsonistic exploitation in contract farming: articulating a strategy for grower cooperation. *Journal of International Development*, 20: 280-296.
- Sriboonchitta, S. and Wilboonpoongse, A. (2008). Overview of contract farming in Thailand: lessons learned. ADBI Discussion Paper No. 12, Tokyo.
- Sue-Chan, C. and Lathan, G. P. (2004). Institutional interview as a predictor of academic and team performance: A study of the mediating effects of cognitive ability and emotional intelligence. *International Journal of Selection Assessment*, 12(4): 312-320.
- Sununtar, S., Pigsun, L. and Adam, S. (2006). Rice contract farming in Lao PDR: Moving from subsistence to commercial agriculture. Asian Development Bank Institute, Tokyo, Japan.
- Swain, B.B., (2008). The role of contract farming in agricultural development in globalise world: an institutional economics analysis. Center for Development Studies, Trivandrum, Kerala India. Retrieved December 3, 2012 from the World Wide Web: <http://mpra.ub.uni-muenchen.de/18683>. MPRA Paper No. 18683 posted 17. November 2009.
- Swinnen, J. and Maertens, M. (2007). Globalisation, privatisation, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics*, 37(1): 89-102
- Tarimo, A. P J. and Takamura, Y. T. (1998). Sugarcane production, processing and marketing in Tanzania. *African Study Monographs*, 19(1): 1-11.

- Taylor, J. E., and Yunez-Naude, A. (2000). The returns from schooling in a diversified rural economy. *American Journal of Agricultural Economics*, 82(2), 287–297.
- Thapa, G. (2010, April). Smallholder or family farming in transforming economies of Asia and Latin America: challenges and opportunities. Paper presented at the international conference on dynamics of rural transformation in emerging economies, New Delhi, India.
- Todd, M. and Forber, G. (2005). Cane payment systems. *Sugar International Journal*, 107 (12): 294–298.
- UNCTAD, (2009). World Investment Report 2009 on transnational corporations, Agricultural Production and Development. UNCAD/DIAE/2009. Geneva.
- UNIDO, (2011). Pro-poor value chain development: 25 guiding questions for designing and implementing agroindustry projects. United Nations Industrial Development Organisation (UNIDO). Vienne, Austria.
- URT, (2001). Tanzania Sugar Industry, Act 2001
- URT, (2005). National Strategy for Growth and Reduction of Poverty (NSGRP)”. In V.P.s Office (Ed.): Mkuki na Nyota.
- URT, (2007). Morogoro Region situation analysis. Ministry of Planning, Economy and Development, Dar Es Salaam, Tanzania.
- URT, (2008). The Economic Survey 2007. Dar Es Salaam: Government Printers.
- URT, (2010). Participatory Agricultural Development and Environment Project (PADEP). Environmental and Social Framework, Ministry of Agriculture and Food Security, United Republic of Tanzania.
- URT, (2013). Ministry of Agriculture, Food Security and Cooperatives 2012/13 Budget speech, Dar Es Salaam, Tanzania.

- USAID (2006). Indonesia Cocoa Bean Value Chain Case Study. Micro REPORT, ACDI/VOCA, Microenterprise Advancement Project Business Development services Knowledge and Practice Trade Order.
- United States Department of Agriculture (USDA), (2011). Sugar: world markets and trade. *Foreign Agricultural Services/USDA*, November.
- Verdonk, M., Dieperink, C. and Faaij, A.P.C. (2007). Governance of the emerging bio energy markets. *Energy Policy* 35: 3909-3924.
- Von Braun, J. and Webb, P.J.R. (1989). The Impact of New Crop Technology on the agricultural division of Labour in a West African setting. *Economic Development and Cultural change* 37(3): 513 – 534.
- Vorley, B. and Bienade, E. (2007, June). Market linkages between small scale producers and dynamic markets: the re-governing markets program. Paper presented at FAO-IAMA Workshop on the Rural Poor and Tomorrow's Markets. Palma, Spain.
- Wiboonpongse, A. and Sriboonchitta, S. (2008). Overview of contract farming in Thailand: lessons learned. ADBI Discussion Paper No. 112. Available at <http://www.adbi.org/discussion-paper/2008/07/16/2660.contract.farming.thailand>
- Williamson, O.E. (1979). Transaction cost economics: the governance of contractual relations. *Journal of Law and Economics*, 22: 233-262.
- Winters, P., Davis, B., Carletto, G., et al. (2009). Assets, activities and rural income generation: evidence from a multicounty analysis. *World Development*, 37(9):1435-1452.
- Winters, P., Davis, B., & Corral, L. (2002). Assets, activities and income generation in rural Mexico: Factoring in social and public capital. *Agricultural Economics*, 27(2), 139–156.

- World Bank, (2007). Agriculture for development, *World Development Report 2008*. Washington DC: the World Bank.
- World Bank, (2011). Making the grade: smallholder farmers, emerging standards and development assistance programs in Africa. *A Research Program Synthesis* No. 62324 – AFR: the World Bank
- Xia, Q. and Simmons, C. (2004). Diversity and prosper: peasant households' participation in emerging markets in northeast rural China. *China Economic Review* 15: 375-397.
- Yamba, F., Brown, G., Johnson, F.X., Jolly, L., and Woods, J. (2008). Bioenergy for sustainable development and global competitiveness: The case of sugarcane in Southern Africa. *Thematic Reports* (3): Markets
- Yin, R. (2003). *Case Study Research Design and Methods*, (3rd Ed.), Sage Publication, Inc. Thousand Oaks, California.
- Young, L.M. and Hobbs, J.E. (2002). Vertical linkages in agri-food supply chains: changing roles of producers, commodity groups, and government policy. *Review of Agricultural Economics*, vol. 24(2):428-441.
- Yunez-Naude, A., & Taylor, J. E. (2001). The determinants of nonfarm activities and incomes in rural households in Mexico with an emphasis on education. *World Development*, 29(3), 561–572.
- Zahidul Islam, K.M., Sipilainen, T. and Sumelius, J. (2011). Access to Microfinance. Does it Matter for Profit Efficiency among Small Scale Rice Farmers in Bangladesh? *Middle East Journal of Scientific Research*, 9(3): 311-323.
- Zhang, X., Huang, J. and Rozelle, S. (2002). Employment, emerging labour markets, and the role of education in rural China. *China Economic Review*, 13: 313-328.
- Zhang, X., & Li, J. (2001). Does Guanxi matter to non-farm employment? EPTD Discussion Paper No. 74. Washington, DC: IFPRI.

- Zhu, N. (2002). The impact of income gap on migration decisions in China, *China Economic Review*, 13: 213-230.
- Zhu, N., & Luo, X. (2005). Impacts of non-farm income on inequality and poverty: The case of rural China. Manuscript.
- Zhu, H. and Wang, X. (2007). Analysis of the influencing factors of tomato growers' participation in contract farming in Xinjiang Autonomous Region. *Chinese Rural Economy*, 7: 67-75.

APPENDICES

I: Cross case analysis for process upgrading possibilities in CF arrangement

Parameters for upgrading	Cases								
	Farmer producer	KSCL producer & buyer	MSEL producer & buyer	Farmer Groups	RCGA	KCGA	MOA	TUCOCPRI COS Ltd	Ministry of Agric.
Training-farm management	No	Trained personnel	Trained personnel	No majority	Yes via ext. off	Yes ext. off & SI	No	No	
Extension services (crop management)	No (majority)	Trained personnel	Trained personnel		Yes, but not regularly	Yes	No	No	
Production information	No	Yes	Yes	No	Yes	Yes	Sometimes	No	
Harvesting information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Market information ⁵	No (majority)	Yes as producer	Yes as producer	No/some	No & not transparent		Not transparent	Not transparent	Problem to farmers
Agro input application	No (majority)	Yes (its cane)	Yes (its cane)	Few	Few	Few	Very few for fertilizer	Very few for fertilizer	
Weeding	No (majority)	Yes (its cane)	Yes (its cane)	Yes once	Yes, but sometimes	Once or no sometimes	Sometimes to some	Sometimes to some	
Harvesting	Yes (majority)	Yes (its cane)	Yes (its cane)	Yes (majority)	Depend on contractors	Depend on contractors	Depend on contractors	Depend on contractors	

⁵ Knowledge on the general price determination, and rendement determination.

Replanting	No	Yes (its cane)	Yes (its cane)	No	No	No	No	No	
Investment on infrastructure	No	Yes (its fields)	Yes (its fields)	No	Yes	some	No	Some	
Agro input provision	No			No	No	No	No	No	
Access to credit	No for the past 5 yrs				Yes with collateral	No	No	Yes to some	
R&D	No	Yes (for its cane)	Yes (for its cane)	No	No	No	No	No	Yes
Pricing method opinion	Unfair (majority)	Fair	Fair	Fair	Fair	Unfair	Unfair		Unfair
Opinion on Output (Ton/acre)	Decline every year	Increase	Increase	Decline	Fluctuates	Decline	Decline	declines	
Payment timing opinion	Delayed (majority)	Timely in most cases	Delayed	delayed	On time in most cases	On time	Delayed	Delayed	
Efficacy of harvesting equipment	Depends on other actors	Yes (to its cane)	Yes (to its cane)	Contractors	Depend on contractors	Depend on contractors	Depend on contractors	Depend on contractors	
Efficacy of Loading equip.	Depends on other actors	Yes	Yes	Yes	Depend on contractors	Depend on contractors	Depend on contractors	Depend on contractors	
Efficacy of Transporting equipment	Depend on other actors	Yes	Yes	Depend on contractors	Depend on contractors	Depend on contractors	Depend on contractors	Depend on contractors	
Efficiency of	Poor		Low	Adequate	Poor		Extracts too	Low	

mills operations							little		
Institutions: enforcement mechanisms	Absent			Weak	Weak	Weak	No	No	
Public policies and regulations	Absent			Sugar Act	Sugar Act	Sugar Act	Sugar Act		

Source: Extracted from case descriptions 2011/2013

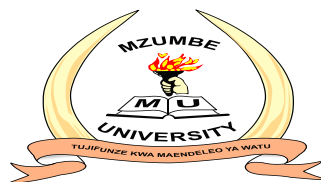
II: CANE PRODUCTION COSTS PER HA FOR 2011/2012 PRODUCTION SEASON

ACTIVITY	UNIT	DESCRIPTION	COST/UNIT	UNITS	TOTAL COST/HA	5YR CROP
RECURRENT COSTS	HA				HA	HA
Clearing	ha		5,000.00	5.01	25,050.00	
Destumping	litre	manual	45,000.00	2.5	112,500.00	
Burning			40,000.00	1	40,000.00	
Riping	ha	optional		0		
Fire breaks		manual	20,000.00	2.5	50,000.00	
1st plough	ha	Tsh 45,000/acre	112,500.00	1	112,500.00	
2nd plough	ha	Tsh 40,000/acre	100,000.00	1	100,000.00	
Harow	ha	Tsh 30,000/acre	75,000.00	1	75,000.00	
Furrow	ha	Tsh 30,000/acre	75,000.00	1	75,000.00	
Seedcane purchase	ton	price at 10% Rend.	42,500.00	10	425,000.00	
Seed cutting	ton	5000/ton	5,000.00	10	50,000.00	
seed loading and unloading	ton	3,300.00	3,300.00	10	33,000.00	
Seed transport	ton	zone 1	6,318.60	10	63,318.00	
Planting	ha	54rows × 2.5 × 1000	135,000.00	1	135,000.00	
Gap filling	ha	10%	27,000.00	1	27,000.00	
Fertilizer DAP	bag	125g/ha (2.5 bags)	75,000.00	2.5	187,500.00	
DAP application	ha	5,000/acre × 2.5	12,500.00	1	12,500.00	
DAP Transport to farm			60,000.00	1	60,000.00	
Drainage	ha		10,000.00	1	10,000.00	
Sub total					1,593,236.00	
Supervision				10%	159,323.60	
Total development cost					1,752,559.60	350,511.92
Maintanance costs						
Fertilizer UREA purchase	bag	225kg/ha (4.5 bags)	55,000.00	4.5	247,500.00	

UREA transport to farm			60,000.00	1	60,000.00	
UREA application	ha	5,000/ha	5,000	1	5,000.00	
Herbicide (post emergence) Volmuron 1	litre	3.5litres/ha	15,000.00	3.5	52,500.00	
Herbicide Volmuron 2	litre	3.5litres/ha	15,000.00	3.5	52,500.00	
1st herbicide application	ha	5,000/ha	5,000.00	1	5,000.00	
2nd herbicide application	ha	5,000/acre × 2.5	12,500.00	1	12,500.00	
1st hand weed	ha	54rows × 2.5 × 1000	135,000.00	1	135,000.00	
2nd hand weed	ha	54rows × 2.5 × 600	81,000.00	1	81,000.00	
3rd hand weed	ha	54rows × 2.5 × 500		1		
Smut check	ha		25,000.00	1	25,000.00	
Fire breaks	ha		25,000.00	1	25,000.00	
Watchmen	months	4 month × 50,000	50,000.00	4	200,000.00	
Sub total maintanance					901,000.00	901,000.00
Supervision	5%		5%		45,050.00	45,050.00
Total maintenance costs					946,050.00	946,050.00
Total cost (establ. & mainte.)					2,698,609.60	1,296,561.92
Harvesting costs: Cutting	ton		5,000.00	75	375,000.00	375,000.00
Loading	ton		3,300.00	75	247,500.00	247,500.00
Hauling	ton	zone 1	6,318.00	75	473,850.00	473,850.00
Sub total harvesting			14,618.00	75	1,096,350.00	1,096,350.00
Total cost (establ., mainte. & harv.)					3,794,959.60	2,392,911.92
Interest on loan (removable)			10%	10%	379,495.96	239,291.19
Grand Total					4,174,455.56	2,632,203.11
REVENUE GROSS			42,500.00	75	3,197,500.00	3,187,500.00

Source: MOA Office Records (2012)

**III: ENHANCING PRODUCTIVITY, MARKET ACCESS AND INCOMES
TO SMALLHOLDER FARMING BUSINESS IN TANZANIA
(POLICOFA)**



CHUO KIKUU MZUMBE

**RESEARCH ON CONTRACT FARMING FOR COTTON, TOBACCO,
SUGARCANE AND SUNFLOWER CROPS**

Questionnaire for Sugarcane 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:.....
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	2. Sex	3. Age	4. Education	5. Occupation	6. Marital status
<p>List household members start with head in no.1 (make sure that the name of household head and the size of the household is the same as household head listed in the cover page)</p> <p>Farther Mother Son/ daughter Relative</p>	<p>M...1 F....2</p>	<p>Years</p>	<p>No school..... 1 Some primary..... 2 Still at P/school....3 Completed primary..... 4 Some secondary....5 Still at S/school....6 Completed sec..... 7 Tertiary8 Degree.....9 Adult education...10 Don't know..... 11</p>	<p>Agriculture...1 Fishing.....2 Mining.....3 Masonry.....4 Carpenter.....5 Employed Government...6 Private Company.....7 Business.....8</p>	<p>Married.....1 Separated.....2 Divorced.....3 Never married.....4 Widow(er).....5</p>
1.					
2.					
3.					
4.					
5.					

SECTION B -1: SUGARCANE- PLANTING AND HARVESTING

We need to collect general information on land ownership and acquisition, including crop planting and harvesting.

1. List all plots owned or cultivated by household in the last year	2. How did you secure such plots? CODE	3. What is the size of each plot? (Acre)	4. What is the distance from plot to Home (KM)	5. What was the main crop cultivated on this plot in the last season? CODE	6. How did the crop cultivated in Q.5 change? By increasing plot size.....1 By reducing plot size.....2 Remained unchanged.....3	7. How can you rate land fertility in each of the plots listed in Q.1? CODE
CODES (Q.2)		CODES (Q.5)		CODES (Q.7)		
<p>Inherited.....1 Discovered.....2 Purchased.....3 Given by village council.....4</p>		<p>Sugarcane.....1 Maize.....2 Rice.....3 Vegetables.....4</p>		<p>Very fertile.1 Fertile.....2 Less fertile.3 Infertile.....4</p>		

13. What were the reasons for not harvesting the entire area? Drought1 Effects of rain.....2 Wild fire.....3 Pests.....4 Lack of market.....5 Retained for seeds.....6 Diseases and social problems.....7 Lack of daily labour.....8 Factory capacity.....9 Others (mention).....10	14. How much tons of sugarcane yields were harvested in the last season? Tons	15. How much tons of sugarcane were sold? Tons
--	---	--

SECTION B-2: INPUT PURCHASE BY CASH					
1. Did you purchase agricultural inputs listed below by cash? Yes1 No2		2. How much agri-input did you purchase? KGS/Liter		3. How much cash spent for agricultural inputs? TSH.	
Seeds		Seeds		Seeds	
Organic fertilizer		Organic fertilizer		Organic fertilizer	
Inorganic fertilizer		Inorganic fertilizer		Inorganic fertilizer	
Herbicides/pesticides		Herbicides/pesticides		Herbicides/pesticides	

SECTION B-3: AGRICULTURAL INPUTS ON CREDIT					
1. Did you receive any seeds, fertilizer, pesticides or herbicides for the plot on credit to be paid back later on during last season Yes1 No2	2. Who advised you on the type and amount of inputs to use? Buyer1 Farmer2 Association....3 According to contract.....4 Others5	4. How much did you receive? KGS/LITRE	5. How much did you pay per unit? TSH.	6. How much payment in advance did you make? TSH.	

Seeds			Seeds		Seeds		
Organic fertilizer			Organic fertilizer		Organic fertilizer		
Inorganic fertilizer			Inorganic fertilizer		Inorganic fertilizer		
Herbicides/pesticides			Herbicides/pesticides		Herbicides/pesticides		

SECTION B-4: VOUCHER PAYMENT SYSTEM

1. During the last season, did you receive input voucher from government for sugarcane cultivation? Yes.....1 No2	2. Wht type of input voucher did you receive? Seeds1 Organic fertilizer....2 Herbicides / pesticides3	3. When was the input voucher received? Month	4. What is the right period to receive input voucher? Month	5. Have you redeemed your input voucher? Yes.....1 No.....2	6. What was the cash-value for the input voucher received? TSH.	7. How can you rate the benefits obtained through voucher system? Highly beneficial...1 beneficial.....2 Not beneficial at all.....3
--	---	---	---	--	---	--

7. How did you repay your input-credit? Direct deduction from sales.....1 Payment through farmer groups after sales.....2 Payment was done through banks.....3	8. How much was the total cost of inputs on credit? TSH	9. From whom did you receive these inputs on credit? Buyer1 Agent2 Cooperative/association.....3 Business person..... 4 Crop board.....5 Others (specify).....6
--	---	--

SECTION B-5: (b) HIRED LABOUR

Land Preparation and Planting		Weeding Number of Weeding.....		Harvesting	
Days Spent	Total Wage Paid (Tsh.)	Days Spent	Total Wage Paid (Tsh.)	Days Spent	Total Wage Paid (Tsh.)

SECTION B-6: FARM IMPLEMENTS AND MACHINERY

Please give details of farm implements used or owned by the household in the past 12 months

SECTION B-5: (a) HOUSEHOLD LABOUR				
1. During the last cropping season, how many days did household members and hired labour spend on the following activities?	2. During the last cropping season, how many days did household members spend on the following activities?			3. Did you hire any labour to work on this plot in the last season? Yes.....1 No.....2
	Land preparation and planting	No. of Weeding	Harvesting	
	DAYS	DAYS	DAYS	
Land preparation & planting: DAYS.....				
Weeding: DAYS.....				
Harvesting: DAYS.....				

No.	Agricultural implements	1. What farm implements did you use in the cultivation of the sugarcane among the listed below?	2. What was the implement listed used for? Explain activities done by each of the implements for sugarcane activities.	3. How many days were spent by each of the implements to finish the activities in identified in Q.2?
1	Tractor			
2	Tractor harrow			
3	Hand powered sprayer			
4	Oxen/livestock			
5	Ox- plough			
6	Ox seed planter			
7	Ox cart			
8	Watering cane			
9	Ox seed planter			
10	Wheel barrow			
11	Water Pamp			
12	Tractor Trailer			
13	Ridger			
14	Others (specify)			

<p>4. Does your household own the implements used in sugarcane cultivation? Yes1 No2</p>	<p>5. If NO, where did your household hire from? Private individuals in the village.....1 Farmers' association (e.g MOA).....2 Govt. agricultural Centre.....3 Buyer4</p>	<p>6. How much did your household pay to hire the mentioned item(s) in the last production season? Total in Tsh.</p>
--	--	---

SECTION B-7: EXTENSION SERVICES FOR SUGARCANE CULTIVATION

<p>1. Did you receive any agricultural advice in the last production season? YES.....1 NO.....2</p>	<p>2. What type of agricultural advice did you receive? Cultivation.....1 Marketing.....2 Prevention of crop disease....3 Harvesting.....4 Crop management at farm....5</p>	<p>3. Where did you mostly receive the agricultural advice from? Government1 Cooperatives.....2 Farmers Association.....3 Buyers/Traders.....4 Small scale farmers network....5 Relative (s) within family.....7</p>	<p>4. Did you receive the said agricultural advice timely? YES.....1 NO.....2</p>
--	--	--	--

<p>5. How would you rate the advice received? Good.....1 Average.....2 Unsatisfactory.....3</p>	<p>6. Did you pay anything in order to receive the advice? Yes.....1 Go to Q. 7 No.....2 Go to Q. 8</p>	<p>7. How much did you pay? (TOTAL COST REQUIRED HERE) TSH.</p>	<p>8. Why didn't you pay anything? Part of the contract.....1 Government offers freely.....2 Farmers association/ cooperative.....3</p>	<p>9. How often did you receive extension services in the last season? Never.....0 Once.....1 Twice.....2 Thrice.....3 More than three times.....4</p>
--	--	--	---	--

<p>10. Did you receive information on agricultural production and marketing for sugarcane in the last season? Yes.....1 No.....2</p>	<p>11. What type of information did you receive? Price.....1 Farm inputs....2 Market.....3 Group networking....4 Credit.....5</p>	<p>12. Where did you mostly receive information on agricultural production and marketing? Government1 NGO.....2 Cooperatives.....3 Farmers Association(s).....4 Large scale farmers.....5 Neighbour.....6 Trader.....7 Buyer.....8 Others9</p>	<p>13. Did you pay anything for the information you received? Yes.....1 No.....2</p>
---	--	--	---

SECTION B-8: SUGARCANE- SALES							
Crop	1. Distance to market	2. How did you transport the crop?	3. Total tons of sugarcane sold	4. Price per ton	5. Total sales value	6. Transport costs (TSH)	7. How was sugarcane quality determined?
Sugarcane	0-5KM.....1 6-10KM.....2 11-15KM....3 16-20KM...4 Above 20KM.....5	On Foot.....1 Bicycle.....2 Animal.....3 Animal cart.....4 Car.....5 Other (Specify). 6					Laboratory test.....1 Physical appearance.....2 Production history.....3

8. Who does the grading of the crop? Farmer.....1 Sponsor.....2 Special grader.....3 Crop board.....4 Other (specify).....5	9. What things does the price offered depend ON? Quality1 Quantity.....2 Time.....3 Buyers' competition.....4 Others (specify)..5	10 What was the methods of selling Personally looking for buyers.....1 Selling through middlemen.....2 Selling to marketing cooperatives.....3 Direct to the factory.....4 To the factory through farmers' association.....5

11. What are the payment mechanisms? Deducted from sales...1 Cash on uploading.....2 Cash on delivery.....3	12. What is the payment principle? Volume.....1 Truck.....2 Distance.....3 Distance & volume...4	13. Did you encounter any crop loss during the last harvest? Yes1 No2	14. What were the reasons for the loss? Rotting.....1 Insects.....2 Rodents.....3 Pests.....4 Theft.....5 Fire.....6 Weather (Rain, Wind etc.)...7 Lack of market.....8 Other (Specify).....9	15. What was the estimated value of this lost crop? Shillings

SECTION C-1: OTHER CROPS CULTIVATED IN THE LAST SEASON					
1. List by priority other important crops cultivated in the last season.		2. How much were harvested for each crop?	3. What was the price per bag/'kiroba'/kgm for each crop listed in Q. 1	4. What was the total value of the sale?	5. How much production and harvesting costs were incurred in each crop listed in Q.1?
Maize.....1					
Rice2					
Vegetables3					
Cassava4					
Sunflower5					
Others (specify).....6					
CROP TYPE (code)	ACRE	GAGS/KIROBA/ KGS	SHILLINGS	SHILLINGS	SHILLINGS

SECTION D: 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 (Go to Q. 10)

12. How do you rate these conditions?	13. How do you pay your loan?	14. Are there any difficulties in obtaining loan?	15. If YES in Q. 14, mention all difficulties		
About right.....1 Harsh.....2 Too harsh.....3 Much too harsh.....4	Direct deduction from sales.....1 Cash through banks.....2	Yes.....1 No.....2	Powerless.....1 Voiceless.....2 Vulnerability.....3 Corruption.....4 Selfishness.....5 Nepotism.....6 Others.....7		
16. What did you DO with the loan?	17. How do you finance your agricultural activities?	18. Do you own a bank account?	19. If NO, why don't you have a bank account?	20. How do you make savings?	
For subsistence needs.....1 Medical costs.....2 School fees.....3 Ceremony/wedding.....4 Purchase sugarcane agro-inputs.....5 For other business input.....6 Purchase agro machinery.....7 Buy/build dwelling.....8 Purchase land.....9 Non-cane agriculture activities.....10 House improvement.....11 Others.....12	Own saving.....1 Borrowing.....2 Both.....3	Yes.....1 No.....2	No enough money to save.....1 No bank services nearby.....2 Not aware of the importance of bank account.....3 Mobile phones account.....4 Keep at home.....5	Through local village groups.....1 Through (SACCOS).....2 Through buying assets.....3 AMCOSS.....4 Banks.....5 At home.....6	
1 ST	2 ND	3 RD			

SECTION E: CONTRACT FARMING/ OUTGROWERS SCHEME

1. Did you cultivate sugarcane as part of contract farming system at any time over the last 12
Yes...1 No...2.

If YES go to Q. 2

If No go to Q. (15 -18); 23-

<p>2. What was the reason for you entering in contract farming?</p> <p>Lack of inputs.....1 Market access.....2 Credit access.....3 Extension services.....4 All The above.....5 Other (Specify).....6</p>	<p>3. What was the type of contract you entered?</p> <p>Written.....1 Verbal.....2</p>	<p>4. How many acres are under contract farming system?</p> <p>ACRES</p>	<p>5. What did you agree in advance with the buyer as part of this scheme? Tick as many as possible</p> <p>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</p>	<p>6. Would you say that the buyer complied with the original agreement?</p> <p>Yes.....1 No.....2</p>		
<p>7. What were the main problems lead a buyer not complying with the contract?</p> <p>Did not buy all crop.....1 Delays in payment.....2 Changed price.....3 Quality low.....4 Other.....5</p>	<p>8. Would you say that you complied with the original agreements?</p> <p>Yes.....1 No.....2</p>	<p>9. What were the main problems that lead you (a farmer) not to comply with the contract?</p> <p>Sold elsewhere.....1 Planted less.....2 Produced less.....3 Did not meet required Standard.....4</p>	<p>10. How do you handle conflicts in case of contract breach?</p> <p>Negotiations.....1 Mediation.....2 Reconciliation.....3 Arbitration.....4 Other (specify).....5</p>			
<p>11. What are the enforcement mechanisms if the contract is breached?</p> <p>Individual.....1 Court.....2 Outside court...3 Farmer groups...4 Cooperatives.....5</p>	<p>12. Does the enforcement mechanism work?</p> <p>Yes.....1 No.....2</p>	<p>13. Is there any exit or termination of contract clause for both parties?</p> <p>Yes.....1 No.....2</p>	<p>14. What are the criteria for participation in contract farming arrangement?</p> <p>Group formation....1 Membership in Cooperative Unions.....2 Farm size.....3 Residence.....4 Other.....5</p>	<p>15. Do you belong to any farmer group?</p> <p>Yes....1 No.....2</p>	<p>16. How do you benefit from the group?</p> <p>Services.....1 A criteria for contract.....2 Loan.....3 No benefits...4 Others.....5</p>	<p>17. What is the group size?</p>

<p>18. How long have you been in the farmer group?</p> <p>One Year.....1 Two Years.....2 Three Year.....3 Four Years.....4 More than 4 years.....5</p>	<p>19. What are the organisations/ associations dealing with promotion of contract farming in your area?</p> <p>Private companies (mention them).....1 International organisations.....2 Local Government Authority.....3 Individuals.....4 Buyers.....5 Financial Institutions.....6 Sugar board.....7 Other (specify).....8</p>	<p>20. What are the roles of the institutions you have mentioned regarding to contract farming?</p> <p>Provision of extension services.....1 Inputs on Credit.....2 Farmer group formation.....3 Contract negotiation skills.....4 Market information.....5</p>	<p>21. Are you willing to continue with CF?</p> <p>Yes.....1 No.....2</p>
<p>22. How do you sell your crop?</p> <p>Large scale farmers.....1 Individuals.....2 Middlemen.....3 Sponsor/processor.....4 Cooperatives/association.....5</p>	<p>23. Are you satisfied with the current market situation?</p> <p>Yes1 No2</p>	<p>24. If NO in Qn. 23, what are the market problems facing you when selling your crop?</p> <p>Unreliable market.....1 Poor infrastructure.....2 Lack of market competition.....3 Lack of market information.....4 Price fluctuation.....5 Delay payment.....6 Unreliable weighing system.....7 Problem in Rendement determination.....8 Costs of transportation to milling station.....9</p>	

25. What problem (s) do you face regarding sugarcane production and Marketing? [Tick the correct ones]

- i. High price of seeds
- ii. Poor quality of seeds†
- iii. High production cost
- iv. Unreliable market
- v. Unreliable weather
- vi. Delayed payment
- vii. Lack of inputs†
- viii. Disease
- ix. Poor infrastructure
- x. Lack of market information†
- xi. Increased competition level against competing commodities.
- xii. Low fertility of soils

Other _____

SECTION F: NON-SUGARCANE INCOME ACTIVITY PARTICIPATION

1. Did you participate in non-sugarcane activities any time over the last 12 months
 Yes...1 No...2.

2. If YES, What type of activity did you participate in? (Tick all applicable)

Farm employment.....1

Off-farm employment....2

Wage jobs.....3

SECTION F-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? <div style="border: 1px solid black; padding: 5px;"> Central government...1 Local government.....2 Parastatal.....3 Political party.....4 Cooperative.....5 NGO.....6 Religious org.....7 Private Sector.....8 Agriculture.....9 </div>	3. Did you receive wages, salary or other payment in cash or kind Yes.....1 No.....2	4. If NO, What is the main reason for receiving no payments? Volunteer1 Compensate...2 Others3	5. If YES, How were you paid? <div style="border: 1px solid black; padding: 5px;"> Hourly.....1 Daily.....2 Weekly.....3 Monthly.....4 Quarterly.....5 Semi-annually.....6 Yearly.....7 Piece work.....8 </div>

SECTION F-2: OFF-FARM (SELF EMPLOYMENT)				
1. Did you operate any business or do any employed activity in the last year other than agriculture? Yes.....1 No.....2	2. What kind of business did you operate? Agriculture.....1 Fishing.....2 Mining.....3 Tourism.....4 Unpaid family work.....5 No job.....6 Job seeker.....7 Employed by Government.....8	3. How much gross income do you earn per day/month/year (Tsh)	4. How much were the operating costs related to your business? Per day/month/year? (Tsh)	5. What was your profit from your business or businesses last year as recorded daily/monthly/ yearly? (Tsh)

List all other sources of income earned by your household over the last 12 months				
Source of income	Put number 1,2,3,...along the income source as a priority indicator	Yearly average gross income earned	Cost of operation / production	Yearly net income.
Crop selling except sugarcane (list all)				
Livestock selling including livestock products				
Forest products e.g. charcoal, firewood, timber etc.				
Remittances				
Other sources (specify)				

SECTION G: ASSETS AND WEALTH		
1. Type of house owned	2. Agricultural Assets	3. Non Agricultural Assets
1.Roofing:		
Corrugated iron sheet.....1	Tractor.....1	Car.....1
Grass thatched.....2	Plough.....2	Motorcycle.....2
2.Floor:	Wheelbarrow.....3	Livestock.....3
Concrete.....1	Cart.....4	Television.....4
Earth.....2	Hoe.....5	Radio.....5
3.Wall	Other.....6	Bicycle.....6
Burnt bricks.....1		
Cement blocks.....2		
Mud and trees.....3		
Un burnt bricks.....4		
Grass.....5		
Iron sheet.....6		
Timber.....7		

GENERAL REFLECTION QUESTIONS FOR SECTION E:					
1. On your opinion, does contractual arrangement exist and known to every stakeholder in your area?	2. Does the act of the agribusiness firm reflect the agreed terms of contract?	3. Does the intension of the act by the firm affect others adversely?	4. Does each part in the agreement act according to the agreement?	5. Does the government play its role in the contract governance?	6. Does the financial institutions action affect other actors adversely?
Yes1 No2	Yes1 Non2	Yes1 No2	Yes1 No2	Yes1 No2	Yes.....1 No.....2

Thank you so much/ Asante Sana