

**EFFECTS OF NON-TARIFF BARRIERS ON MAIZE PRODUCTION
AND MARKETING IN SONGWE REGION OF TANZANIA**

PETRO KABUPI MAZIKU

**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY OF SOKOINE UNIVERSITY OF
AGRICULTURE. MOROGORO, TANZANIA.**

ABSTRACT

This study assessed the effect of Non-Tariff Barriers (NTBs) on production and marketing of maize for smallholder farmers in Mbozi and Momba Districts located in Songwe region in Tanzania. Specifically, the study pursued the following objectives to; i) determine the percentage contribution of NTBs on transaction costs for smallholder farmers and traders in the two districts (ii) determine the influence of NTBs on market participation decisions for smallholder farmers in the two districts (iii) examine the extent of the effects of NTBs costs on smallholder maize farmers' price in Mbozi and Momba Districts and (iv) assess the effects of NTBs on maize production and marketing for smallholder farmers in the two districts. Cross sectional survey design was used in gathering primary data. A two-stage stratified sampling procedure was used in the selection of 400 smallholder farmers. Also, 50 traders were randomly selected from the two district markets of Mlowo and Tunduma. The structured questionnaires and focused group discussion were used to collect primary data. To estimate the effect of NTBs on farmers' decisions on market participation, two stages Heckman and duality models were used. The findings indicate that higher NTBs costs were incurred by farmers in getting clearance at weighbridges in Mbozi and Momba Districts followed by police check points. Decisions on market participation were negatively influenced by NTBs and distance to the market. Additionally, results from t-test indicate that there is a significant difference in NTBs effect on maize prices between farmers in the two districts. The difference in NTBs effects was explained by spatiality that Momba District is closer to Tunduma market. Based on these findings, it is concluded that, the effects of NTBs on price and production are higher for famers living far from the urban markets as opposed to those who live close to the markets. Therefore, the study recommends for the reduction and or removal of the NTBs which impede maize production and marketing among smallholder farmers. This would help the government to achieve its

goal of creating high prices in the surplus districts and of attaining low consumer prices in the deficit urban centres.

DECLARATION

I, PETRO KABUPI MAZIKU, do hereby declare to the Senate of Sokoine University of Agriculture that this thesis is my own original work done within the period of registration and that it has neither been submitted nor concurrently being submitted for a higher degree in any other institution.

Petro Kabipi Maziku

(PhD Candidate)

Date

The above declaration is confirmed by:

Prof. Joseph P. Hella

(Principal Supervisor)

Date

Dr. Jeremia R. Makindara

(Associate Supervisor)

Date

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LIST OF ABBREVIATIONS AND SYMBOLS

ACT	Agricultural Council of Tanzania
ADPWB	Agricultural Distortions Project for World Bank
AHM	Agricultural Household Model
AIDS	Acquired Immune Deficiency Syndrome
AMA	American Marketing Associations
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASEAN	Association of Southeast Asian Nations
CGEM	Computable General Equilibrium Model
DAICO	District Agricultural, Irrigation and Cooperative Officer
DAS	District Administrative Secretary
DEO	District Education Officer
DRC	Democratic Republic of Congo
EAC	East African Community
EOs	Extension Officers
ESAFF	Eastern and Southern African Small Scale Farmers Forum
FAO	Food and Agriculture Organisation of the United Nations
FAOSTAT	Food and Agriculture Organisation Statistics
FGDs	Focus Group Discussions
FOC	First Order Condition
GTAP	Global Trade Analysis Project
HIV	Human Immunodeficiency Virus
IFPRI	International Food Policy Research Institute

KI	Kilimanjaro International Company Ltd
LDCs	Least Developing Countries
LGA	Local Government Authorities
LOP	Law of One Price
MALF	Ministry of Agriculture, Livestock and Fisheries
MITI	Ministry of Industries, Trade and Investment
MT	Metric Tons
NAIVS	National Agriculture Inputs Voucher Scheme
NBS	National Bureau of Statistics
NFRA	National Food Reserve Agency
NIE	New Institutional Economics
NTBs	Non -Tariff Barriers
OLS	Ordinary Least Squares
RDS	Research and Development Strategies
SADC	Southern Africa Development Community
SAEBS	School of Agricultural Economics and Business Studies
SPS	Sanitary and Phytosanitary
SEM	Spatial Equilibrium Model
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TBT	Technical Barriers to Trade
TC	Transaction Costs
TCE	Transaction Cost Economics
TRA	Tanzania Revenue Authority

TRI	Trade Restrictiveness Index
TZS	Tanzania Shillings
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations, Education, Scientific and Cultural Organisation
URT	United Republic of Tanzania
USAID	United States Agency for International Development
USD	United States Dollar
VEOs	Village Executive Officers

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Maize, rice, and wheat are the main cultivated staple food crops in the world including the Sub-Saharan African countries (SSA). Among of these crops, maize has emerged as a crucial staple crop of guaranteeing food security in most of SSA in the last few decades (Friedrich and Kassam, 2016; FAOSTAT, 2015). This is because food security in these countries is linked to staple food production and marketing (Mbise *et al.*, 2010; ACT, 2010; KI, 2011). In most of SSA, maize is the most widely-grown staple food crop, which is planted in more than 33 million hectares (ha) each year (FAOSTAT, 2015) and it is considered as the major tradable crop both locally and internationally (FAOSTAT, 2009; World Bank, 2012; Moctar *et al.*, 2015). However, the maize subsector in these countries exhibits a very low productivity with the average yield of about 1.1 ton per hectare even with improved seeds (Friedrich and Kassam, 2016). The decrease in maize production in these countries has increased the gap of food deficit between food production and demand whereby food requirements have increased for about 100 million tons of cereal food crops in year 2014 (FAOSTAT, 2015; Minot, 2014).

Similar to other countries in SSA, maize in Tanzania is considered as the most important staple food crop, grown in 45% of the total arable land and generates nearly 50% of the rural cash income for smallholder farmers (UNESCO, 2011; FAO, 2013; URT, 2013). Moreover in Tanzania, maize is consumed by the majority (about 90%) of its population followed by rice (17%) which is more preferred staple food for medium and high income earners (KI, 2011; National Bureau of Statistics (NBS), 2008; Minot, 2014). Thus, an increase in maize production and marketing has the potential of raising the income and welfare of poor smallholder famers in Tanzania.

However, for the past 10 years, maize production in Tanzania has varied considerably over the years, ranging from 3.3 Metric tons (MT) in 2005/06 to 5.4 MT in 2013/14 (UNESCO, 2011; NBS, 2014). Furthermore, maize production in recent years has declined from 4.7 to 4.3 metric tons in years 2010/11 and 2011/12 and continued to fluctuate further from 5.4 to 5.0 MT in years 2012/13 and 2013/14 respectively (NBS, 2014; Indeximundi, 2015; BMI, 2016). This amount of maize has remained below the country demand for the annual staple food crops of 11MT for both maize and rice whereby the maize demand accounts for about 5.9 MT on the total demand (11 MT) (Minot, 2010; Haug and Hella, 2013; BMI, 2016). The decline in the production and supply of maize can be linked to the impact of climatic change, inefficient use of improved farm technologies, and excessive transaction costs emanating from government interventions on the marketing of staple food crops through food security policies (WEMA, 2010; FAO, 2016). For example, the negative growth rate of 8.3% in year 2011 and 6.7% in 2014 (Figure 1) for maize production in Tanzania can be linked to the imposed road blocks and weigh bridges within regions and bans on maize exports to the neighbouring countries which were implemented by the Government in 2011 and 2013. This caused a decrease of maize production from 4.7 metric tons in 2010 to 4.3 metric tons in year 2011 (Minot, 2014; Indeximundi, 2015). This situation was reported to have discouraged maize farmers especially in the major producing regions (Mbeya, Songwe, Iringa, Njombe, Ruvuma, Rukwa and Katavi) from allocating more productive resources (land, capital and labour) on maize production in year 2009, leading to poor maize production that year as opposed to the previous year of 2008 (Figure 1).

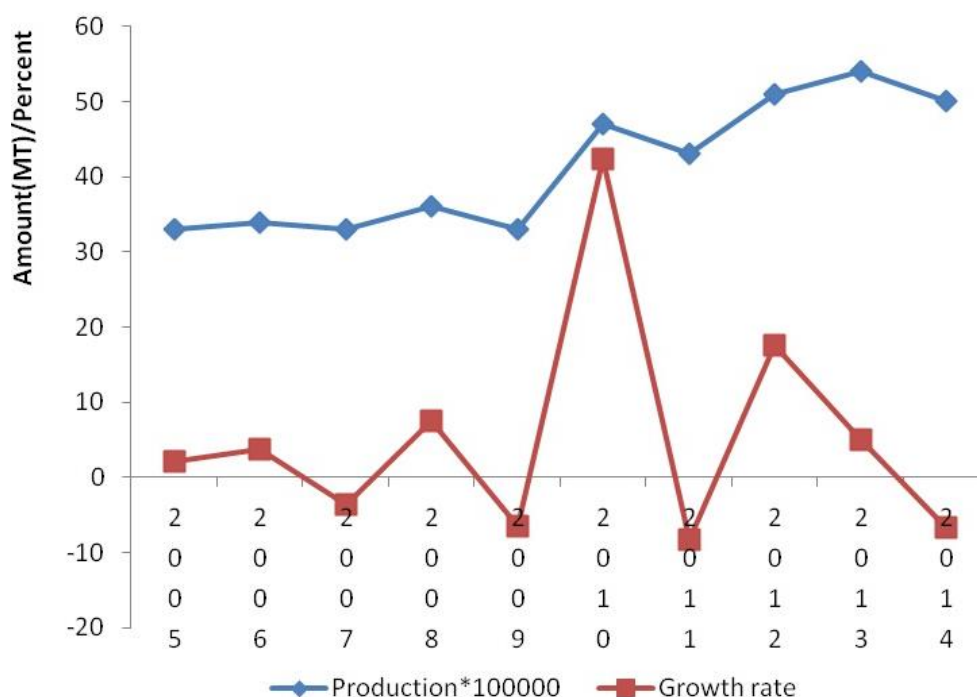


Figure 1: Maize production and growth in Tanzania for period of ten years (2005-2014)

Source: NBS (2014) and Indeximundi (2015)

Moreover, the excessive transaction costs emanating from Non-Tariff Barriers (NTBs) application are also reported to have reduced the benefits of protection policy and keep producers' prices for maize lower than what would have been the case without protection (Van Camphenhout, 2007; FAO, 2013; Sebatta *et al.*, 2014; Magrinia *et al.*, 2014). Transaction costs in this study refer to all the costs involved in transacting a product in the markets (Holloway *et al.*, 2000; Staal *et al.*, 1997), and which include both the costs derived from the NTBs strategies imposed by the government in ensuring the availability of food and that from search, screening, negotiation, monitoring and enforcement. On the other hand, marketing costs, which involve direct costs on marketing functions and services such as transportation and assembly costs, handling costs, processing and storage costs, operating cost as well as other costs as taxes and physical losses (FAO, 2011), were rarely included as they are not in the scope of this study.

According to the World Bank's Agricultural Distortions Project (ADP) (2008), the staple food sub-sector in Tanzania is still highly regulated and price incentives remain strongly distorted. When comparing with her neighbouring countries such as Kenya and Uganda who have changed their policies from taxation to a slight support of farm-gate prices, Tanzania prices are still lower (Ihle *et al.*, 2010; Onono *et al.*, 2013). This situation is caused by intervention by the Government of Tanzania (GoT) on marketing of staple food crops through imposition of arbitrary trade restrictions which include tariffs and NTBs from time to time (Karugia *et al.*, 2009; Gabagambi, 2013). NTBs in this study refer to policy measures other than ordinary customs tariffs that are instituted by governments to ensure food security and price stability in the country (Mold, 2005; Karugia *et al.*, 2009). These include; roadblocks, Municipal and Council permits, trade license, customs procedures, red tape and weighbridges as applied at the region, district, and wards levels within the country. However, NTBs which are involved in cross border maize trade such as export bans, quotas and those related to Technical Barriers to Trade (TBT), Sanitary and Phytosanitary (SPS), standards and regulations were not considered in the analysis of this study. This study focused only on this lower level of the maize supply chain because the imposed NTBs by the government in the first place are implemented by local councils at the region and district levels. Thus, their presence at the district and regions are believed to have significant effects on farmers' decisions on production and marketing within the country.

Moreover, government interventions in the form of NTBs have been reported by the World Bank (2012) and Karugia *et al.* (2009) as an obstacle for smallholder farmers against accessing both village and district markets. Furthermore, in its recent report of "Doing Business" the World Bank has ranked Tanzania as number 145 country out of 189 countries for ease of doing business, which is away below her regional partners such as Rwanda (32), Kenya (129), Uganda (132), and Burundi (140) (Ancharaz, 2014). As argued

by Haug and Hella (2013) that, government interventions on maize marketing increases the transaction costs in terms of NTBs strategies which resource poor rural households adopt when deciding to participate in the marketing and selling of their produce.

It is also argued that the higher transaction costs, which are associated with the marketing of maize, could be linked to smallholder farmers' difficulties in accessing the markets and therefore they are completely excluded from market participation (Makhura *et al.*, 2001; Bwalya *et al.*, 2013). Similarly, in another study Mbise *et al.* (2010) observed that the extent of transaction costs as attributed to NTBs is likely to affect the farmers' decisions on how much quantity to supply to the market. Furthermore, Bwalya *et al.* (2013) observed that in SSA countries, smallholder farmers contribute only about 20% to 30% of the marketable maize surpluses. The low rate of supply and market participation could also be contributed by high transaction costs incurred by smallholder farmers in accessing adequate and timely markets as well as getting high prices.

Moreover, as noted by Karugia *et al.* (2009) NTBs accounts for about 13% of the total maize transaction costs in Tanzania which, on the other hand, could worsen the ability of farmers from accessing different market opportunities which are being created by different economic integrations such as the East African Community (EAC) and Southern Africa Development Community (SADC). While maize prices in Tanzania are decreasing due trade barriers, studies by Gabagambi (2013) and Gilson and Charalambides (2011) revealed that maize from Tanzania is highly demanded in Kenya, the Democratic Republic of Congo (DRC), South Sudan and Somalia where market prices are higher than Tanzania's local markets. This implies that continuing imposing NTBs on staple crops such as maize will continue to confine poor rural farmers to village markets and thus denying their

participation in the newly emerging marketing opportunities in the EAC markets such as South Sudan and Somalia.

Although maize is produced by farmers from all over the country in Tanzania, about 40% of the national production comes only from few regions in the Southern Highlands namely Mbeya, Songwe, Iringa, Njombe, Ruvuma, Rukwa and Katavi followed by Arusha and Manyara in the Northern part of Tanzania which account for about 16% of the total maize produced (Match Makers Associates, 2010; Mkenda and Van Campenhout, 2011). Of the total maize outputs produced, only 30% of maize surpluses from these regions are reported to be reaching the markets both in the region and in the main consumer markets of cities such as Dar es Salaam and Arusha (Arega *et al.*, 2007; Rasmussen, 2009; Minot, 2010; FAO, 2013).

1.2 Problem Statement

In recent years, maize production in Tanzania has been experiencing declining trends as a result of climate change and limited access to formal markets by most smallholder farmers. However in the recent years, the promotion of maize production and marketing by the Government of Tanzania (GoT) has been through the implementation of different policies and strategies especially in the major producing regions (Mbeya, Songwe, Iringa, Njombe, Ruvuma, Rukwa, and Katavi). These strategies included the provision of subsidies on farmers' inputs through the National Agriculture Input Voucher Scheme (NAIVS) whereby about USD 300 million were invested for the period of 2008 to 2013 (ASARECA, 2009; Gabagambi, 2013, Aloyce *et al.*, 2014). This was also supported by the purchase of maize from farmers through National Food Reserve Agency (NFRA) at a fixed floor price which is above the market prices (Aloyce *et al.*, 2014; Musumba and Costa, 2015). These two strategies aimed at maintaining low prices in deficit regions and reasonable high maize

prices in surplus areas as an incentive for farmers to produce more maize. This is because with the presence of NFRA, farmers were assured of the market for their maize produce. Despite these government's efforts, the findings from FAO (2013) and Minot (2014) indicate that, the objectives of these efforts are only partially achieved and that too little has changed from farmers' perspective. In addition, the prices for smallholder farmers especially in surplus rural areas continued to decline and the poorest consumers in the urban areas have continued to be burdened with higher prices.

Furthermore in many occasions, NFRA, which is the main maize government buyer, has frequently been constrained with the shortage of funds to purchase much of the maize brought by farmers at the centre due to capital deficit (KI, 2011; World Bank, 2012). This phenomenon has forced farmers to remain with large stocks of unsold maize despite that they have already incurred all the necessary costs of transporting their produce to the buying centres. For instance in years 2013 and 2014, NFRA buying centre at Vwawa and Itepula village in Mbozi District failed to purchase much of the maize brought by farmers at the centre. This trend motivated the current study into investigating the current maize production and marketing in the context of the repeated NTBs strategies interventions and the extent to which these NTBs strategies contribute to the current decline in maize production and supply for farmers in Mbozi and Momba Districts.

Many previous studies in Tanzania have been conducted on the relationship between NTBs costs and maize prices, with most of them emphasizing more on the general effects of NTBs as part of the transaction costs in the cross border trade and little attention has been paid on the production and marketing at the farm level, especially in the surplus areas. Among of these studies include Karugia *et al.* (2009) who analysed trade barriers on maize and cattle trade in EAC. The findings reveal that export ban reduces the welfare of

producers in Tanzania. Also, KI (2011) examined the impact of trade restrictions on domestic and cross border trade in Tanzania and revealed that farmers in rural areas would continue to receive lower prices if the Government imposes trade restrictions. On the other hand, Mkenda and Van Campenhout (2011) estimated transaction costs at different level of maize value chain and revealed that price dispersions (measured by variances) were higher for farmers as compared to traders. Moreover, studies by Porteous (2012) and IFPRI (2013) on the effects of export bans on maize trade using a general equilibrium model, found that temporary export bans reduce the welfare of producers in rural areas, but the price differences between markets was not statistically significant..

However, most of these studies focused only on cross border trade and very little is empirically known regarding the extent to which NTBs costs affect the production and marketing in the local trade context in terms of producer prices and market participation especially in the surplus areas such as Mbozi and Momba Districts in Songwe Region. Therefore, there is dearth of empirical information regarding the extent which NTBs costs affect maize production and marketing. Unlike in the previous studies cited above, and which focused more on the cross border trade and welfare effects of NTBs, the current study has gone one a step further down the maize supply chain in the local trade context to assess the effects of NTBs strategies on farmers' production and decisions to participate in the maize markets in Mbozi and Momba Districts in Tanzania.

1.3 Objectives

1.3.1 Overall objective

The overall objective of the study is to improve maize production and marketing among smallholder farmers and traders in Mbozi and Momba Districts of Songwe region through reduced government market interventions in the form of different NTBs strategies.

1.3.2 Specific objectives

Specifically the study was intended to:

- i. Determine the percentage contribution of NTBs on transaction costs as incurred by smallholder farmers and traders in the study area;
- ii. Determine the influence of NTBs on smallholder maize farmers' decisions to participate in the maize markets in Mbozi and Momba districts;
- iii. Examine the extent to which NTBs affect the prices received by smallholder maize farmers in Mbozi and Momba Districts; and
- iv. Assess the effect of NTBs on maize production and marketing for smallholder farmers in the study area.

1.4 Hypotheses

- i. NTBs costs have no significant influence on smallholder farmers' decisions to participate in maize market in Mbozi and Momba districts.
- ii. The NTBs effects on farm gate prices between smallholder farmers in Mbozi and Momba Districts are the same.
- iii. The implemented NTBs strategies have no significant effect on the quantity supplied by smallholder farmers in Mbozi and Momba Districts.

1.5 Justification for the Study

Previous studies on the effects of NTBs on maize production in Tanzania provided contradicting findings and focused attention on the cross-border trade. For example, Porteous (2012) revealed that temporary export ban was insignificant in explaining the increase in price of maize in Tanzania. Other studies (e.g. Karugia *et al.* 2009; World Bank, 2012; FAO, 2013) reported that transaction costs attributed to NTBs seem to have an effect on the welfare of both maize traders and smallholder farmers due to a decrease in farm gate

prices. These contradictory findings motivated this study which intended to examine in-depth the quantitative effects of NTBs at the level of smallholder farmers in the surplus areas of Mbozi and Momba Districts in Songwe region. Moreover, this study focused on maize production and marketing because maize in Tanzania is the main staple food crop whose production accounted for 72% of the total planted land area with cereals in 2002/2003 and 2014/2015 cropping season (NBS, 2008; 2014). Apart from being a major source of household food, maize is also a major source of income to many rural households because of serving a dual purpose consumption and trade (Doss *et al.*, 2003; Urassa, 2010).

In addition, the empirical evidence on the effects of NTBs on maize production and supply would assist the GoT in implementing policies which provide incentives for producers and traders especially in the surplus districts. Therefore, understanding of the direction and extent of NTBs effects on the maize prices received by producers in Mbozi and Momba Districts has a policy implication to local government administrators and the central government in general in terms of knowing the future direction of maize production and farmers' market participation in Tanzania. Empirical results from the mean different effects of NTB on policy based on spatial distances would help the government to gain the insights on why some policy changes appear to have little or no effects on price stability especially for areas close to the border points. Also, knowledge on the costs attributed to NTBs would assist the GoT to institute more efficient regulations which would ensure a balanced distribution of food between food-deficit and food surplus regions. Moreover, understanding the share of NTBs carried out by traders and farmers in the two districts would be useful to the Government and the private sector in gaining the entry point of improving market infrastructures so as to reduce the burden of high transport costs.

1.6 Organization of the Thesis

This thesis is organized into five chapters, Chapter One sets up the background information of this thesis. Chapter Two reviews the literature related on the topic and methods used in the previous studies to address a similar problem. Specifically, the Chapter looks at literature on the theories governing the study, the effects of NTBs on maize production and supply, the factors affecting maize production in the SSA, and the methods of measuring NTBs. This is followed by Chapter Three describes the approaches and methodology used in this study. Also, it explains the choice of study areas, design and sampling methods, models specification and procedure of data collection, and data processing and analysis. Chapter Four presents and discusses the findings of the study specifically on the households' and traders' characteristics, effects of NTBs on price, and market participation and maize production. Chapter Five presents the conclusions and recommendations based on the major findings of the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Key Concepts

This section defines the key terminologies used in this study. These include smallholder farmers, Non-Tariff Barriers, Tariff Barriers, Marketing, Market participation and transaction costs.

2.1.1 Smallholder farmers

Literature has defined differently who a smallholder farmer is. In the works of Chayanov (1966) and Ellis (1996) a smallholder farmer has been described as a producer at subsistence level. On the other hand, Temu and Temu (2005) characterized smallholder farmers as farmers with a farm land ranging from 0.25 to 3 ha and whose production is mainly relying on rain fed. Also according to Lund and Price (1998) argued that, it is difficult to describe a smallholder farmer in terms of output because even large scale farmers may produce the same outputs as smallholder farmers. To avoid the above complications Von Braun (2005) defines a smallholder farmer in terms of resource use that is, a smallholder farmer relies on natural resources, has limited market access and internal resources including land and capital, and thus depends more on family labour for production activities.

In this study therefore, a smallholder farmer is considered as the one who produces maize for both subsistence and for the market (i.e. producer and consumer at the same time), but depends heavily on limited internal resources such as capital and land, which have an impact on his/her access to better market opportunities in the nearest urban markets.

2.1.2 Marketing

The concept marketing has been defined differently by many scholars in the literature of marketing and production economics. For example, the American Marketing Association (AMA) (2008) defines marketing as an activity, a set of institutions and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and the society at large. Gabagambi (2011) defines marketing as the performance of all the transactions and services associated with the flow of a good or a service from the point of initial production to the final consumer. Moreover, Kohls and Uhls (1990) define marketing as a process of creating form, time, and space utility. In this respect, agricultural marketing refers to the performance of all business activities which are involved in the flow of goods and services from the point of initial agricultural production to the ultimate consumer (Kohls and Uhls, 1990). Elsewhere, Dixie (1989) defines agricultural marketing as a series of steps which are involved in moving a product from the point of production to the point of consumption in the urban centres. In the same token, USAID (2013) defines agricultural marketing as a process of identifying, communicating with, and maintaining relationships with buyers of a producer's products, and which directly affect volume, value, and timing of sales. Marketing activities enable the producer to find new buyers, build and maintain relationships with current buyers and access market research to manage the supply and the anticipated demands.

From the foregoing definitions, marketing concepts must not only be adopted by the entire organizations, but also by the entire marketing system in which agricultural products flows. This is because a market system constitutes many different market actors in different dimensions. FAO (1995) classifies a marketing system into two dimensions; firstly, is the institutions, organizations and enterprises, and regional and district authorities which participate in the market. The second is the functions which these participants perform in

delivering the product to the markets. Kohls and Uhls (1990) classify further the functions involved in agricultural and food marketing processes into two sets of functions of a marketing system. These are physical functions and facilitating functions whereby the government plays major roles. Each of these functions adds value to the product and they require inputs, thus making it necessary for a player to incur transaction costs in delivering the product to the market.

2.1.3 Market participation

The concept market participation is defined and interpreted in various ways by different scholars. Barrett (2008) defines market participation as the ability of the household to enter the market as a seller or a buyer. Therefore, market participation according to Barrett (2008) has both demand and supply sides; the demand side is when the households enter the market as buyers; and the supply side is when the households participate in the market as sellers. Both decisions made by the households in entering the markets are motivated by the theory of optimization whereby the household seeks to maximise utility, subject to cash and resource constraints (Makhura *et al.*, 2001; Omitt *et al.*, 2009). However, in most of the empirical studies the supply side of the market participation is highly emphasized making many studies to be focusing on the supply side of that equation (Makhura *et al.*, 2001). Based on the supply side, market participation is construed in terms of sales as the fractional of the total outputs produced by the households.

Other scholars (e.g. Jagwe, 2011; Bwalya *et al.*, 2013) define market participation as a state of farmers of being able to buy inputs in the input market or of being able to sell their output in the output market. Furthermore, the intensity of market participation is defined as the quantity of output sold by a farmer from his/her total production or quantity of inputs a farmer is able to purchase in the input market (Jagwe, 2011). However, in this study market

participation was considered from the perspective of farmers' ability to sell their maize output in the output market as a seller and the intensity is referred to as the quantity of maize output sold by farmers in the urban markets in the two districts.

2.1.4 Transaction costs

The concept transaction cost has many meanings and explanations. Some authors such as Holloway *et al.* (2000) and Staal *et al.* (1997) define transaction costs as all the costs involved in transacting a product between markets. Coase (1937) and Hobbs (1997) on the other hand define transaction costs as the costs associated with the searching, negotiation, monitoring, coordination, and enforcement of contracts. Therefore basing on these definitions, transaction costs constitute five components namely, the search cost, screening cost, negotiation cost, monitoring cost, and contract enforcement cost. The searching cost is the cost which is associated with identifying and contacting potential buyers and sellers of a particular product. Screening cost, on the other hand, refers to cost which is associated with gathering information about the reliability of a particular buyer or seller and the quality of the goods being transacted. Negotiating or bargaining cost is the cost of gathering information on prices in other transactions and on factors that might influence the willingness of the other party to bargain. Monitoring cost includes the cost which is associated with monitoring the contract performance and the cost of labour that monitors the delivery of the product. On the other hand, enforcement cost is the cost which is incurred in insuring that contract provisions are met and this includes the costs associated with default provisions in the contracts.

Market costs are defined as the costs that involve direct transaction on marketing functions and services such as transportation and assembly costs, handling costs (loading, unloading, repackaging), processing and storage costs, physical losses as well as other costs such as

taxes, levies, customs, and duties (FAO, 2011). However, in this study transaction costs will include both costs derived from searching, screening, negotiation, monitoring, enforcement and the costs of government NTBs imposed strategies in ensuring availability of food in the country.

2.1.5 Tariff barriers

Tariff barriers refer to the compulsory taxes or custom duties which are imposed on the import or export of goods and services by the Government for the purpose of protecting domestic industry and revenue generation for economic growth (GATT, 2000). These tariffs include VAT, Import duty, Excise duty, Export duty, and other statutory deductions from traders' income. The imposition of these tariffs on the traded goods and services would reduce their flow between markets and across countries and thus reduce the volume of imports and exports.

2.1.6 Non-tariff barriers

The concept NTBs is defined differently by different scholars in the literature of economics and marketing. Baldwin (1970) defines non-tariff barriers as any measure (public or private) that causes internationally traded goods and services or resources devoted to the production of these goods and services to be allocated in such a way as to reduce potential real world income. Elsewhere however, Bora *et al.* (2002) use the term non-tariff measures (barriers) to include export restraints, and production and export subsidies, or measures with similar effects and not just import restraints. Movchan and Eremenko (2003) define NTBs as measures other than tariffs that are closely connected with state (administrative) activity and influence prices, quantity, structure and/or direction of international flows of goods and services, as well as resources used to produce these goods and services.

Moreover, in the EAC protocol (2004) and SADC (2006), NTBs is defined as laws, regulations, administrative, and technical requirements other than tariffs which are imposed by a partner state whose effect is to impede trade (Karugia *et al.*, 2009). Similarly, Nakra (2006) defines NTBs as government laws, regulations, policies or practices that either protect domestic industry or products from foreign competition or artificially stimulate export of particular domestic products. On the other hand, Mold (2005) and Karugia *et al.* (2009) define NTBs as barriers to trade that are not tariffs and include both trade-restricting measures (quotas, technical barriers, etc.) and trade-promoting measures such as export subsidies and the like. However in this study NTBs refers to policy measures excluding ordinary customs tariffs that are instituted by governments to reduce the flow of food crops from one region to another and which are intended to ensure food availability and hence food security and price stability in the country (Karugia *et al.*, 2009; World Bank, 2012). These measures include Municipal and Council permits, export permits, roadblocks associated with bribes; police check points, customs procedures and weighbridges applied at the region, district, and cross borders.

2.2 Theoretical Framework

Decisions of rural farming households to participate in production and marketing has been explained by different economic theories in most of rural development economics studies such as Chayanov (1966), Taylor and Adelman (2003). These studies view the farming households as profit and utility maximizing agents, working in the subsistence rural economy. According to Bwalya *et al.* (2013), the decisions made by farming households on market participation in LDCs especially in the rural areas are influenced by high transaction costs resulting from market failures. However, to capture the impacts of transaction costs on household's decisions, the theory of transaction costs and other three alternative economic theories of farming household behaviour are discussed in this study. The three

alternative agricultural theories include (i) the profit-maximizing theory, (ii) theory of peasant economy and iii) agricultural household theory.

2.2.1 Theory of transaction costs

This theory treat farming households or firms as transaction costs minimizing agents in their exchange of output decisions which involve changes in the nature and sources of transaction costs (Makhura *et al.*, 2001). This implies that, farm households or firms will be willing to be involved in an exchange which could make them incur less transaction costs in terms of searching for information, negotiation, monitoring, co-ordination, and enforcement of contracts (Key *at al.*, 2000; Makhura *et al.*, 2001; Sebatta *et al.*, 2014). Therefore, in the process of carrying out their transactions between firms, farmers and traders are involved in the transfer of property rights which is also included in the contractual terms (Makindara, 2012). The theory sets its assumptions under the Transaction Costs Economics (TCE) which recognizes the role of transaction costs in an organisation or a firm and other contracts (Coase, 1937). Transaction costs in this context are defined as the costs which are involved in the transfer of goods and services from one operation to another (Makhura *et al.*, 2001; Makindara, 2012). The presence of high transaction costs in any market exchange could result into market imperfection (market failure).

In order to capture the effects of transaction costs on market exchange, Makhura *et al.* (2001) observe that the theory of transaction costs is the relevant approach for analysing agricultural markets in developing countries such as Tanzania where markets are not perfect (market failure). The frequent occurrence of market failure and incomplete market information caused by higher transaction costs and information asymmetries in developing countries cannot be explained by conventional neoclassical economics but it requires an institutional analysis especially on the use of transaction costs theory (Eggertson, 1990;

Key *et al.*, 2000; Makhura *et al.*, 2001). Similarly, smallholder farmers and traders in Mbozi and Momba Districts have been experiencing market failures due to government's intervention on staple crops such as maize in the form of NTBs strategies. Therefore, it is on this basis the theory of transaction costs was selected to guide the arguments in this study because; the theory recognizes many business exchanges which can be classified as imperfect or asymmetric in nature.

Delgado and Nicholson (1997) classify transaction costs into observable and unobservable or inhibitive transaction costs. The observable transaction costs include marketing costs such as transport, handling, packaging, storage, spoilage, loading and unloading, and the like, they are said to be observable when there is a transaction taking place (Makhura *et al.*, 2001; Osebeyo and Aye, 2014). On the other hand, unobservable transaction costs include the costs sourced from information searching, bargaining, screening, monitoring, coordination, and enforcement of contract (Makhura *et al.*, 2001; Bwalya *et al.*, 2013; Osebeyo and Aye, 2014). In another study, Furubotn and Richter (2005) divide transaction costs into three categories as follows the first type is marketing costs, these are related to the costs which are incurred in making a good or service reach the market. These costs include the costs of searching for information, bargaining, decision making and the cost related to NTBs. The second category is managerial transaction costs which involve the costs of creating order form, operational costs, the cost of Information Technology (IT), public relation, and the cost of information. Political transaction cost is the third category which includes maintenance costs, manufacturing costs, government regulations and legislations, education and defence, law, and administration.

Moreover, a model developed by Key *et al.* (2000) and Barrett (2008) which is intended to explain why a household, which is endowed with different characteristics chooses to

participate or not to participate in the crop market divides transaction costs into two major categories; i) market related costs and ii) production related costs. Market related costs include transport costs between the farm household's village and the relevant markets, the costs from monopoly behaviour among local traders, the cost of searching for price information, and shallow local markets with more trade barriers. Production-related costs include the costs associated with lack of credit to finance key inputs and low food crop productivity and lack of insurance (credit) against household risks against excessive variation in food market prices and availability. This study therefore, focused more on marketing costs such as NTBs which are unobservable in nature. These costs include the cost incurred by farmers or traders in clearing NTBs obstacles such as road blocks, weighbridge, and police check points and custom procedures which are rarely included in the analysis of many studies. If included these are unlikely to be comprehensively analysed to capture their effect and contribution to farmers marketing costs. However, even though this theory recognizes the decisions made by households under market failure, it has failed to accommodate the dual behaviour of household decision both as a producer and a consumer at the same time.

2.2.2 Theory of profit maximization

Profit maximization is the most important assumption used by economists in formulating various economic theories such as price and production theories (Samuelson and Nordhaus, 2005). This theory views farming households as profit maximises in a perfectly competitive market. As a neoclassical theory of the firm, it postulates that, the main objective of a business firm is profit maximization. Conflicting evidence apart from this approach is that, profit maximization has both a behavioural content (motivation of the household) and a technical-economic content (economic performance of the farm as a business enterprise) (Mendola, 2005). In reality however farming households have several goals such as long

term income stability, family food security and others which on the other hand influence their production decisions. This argument creates the grounds for economists to criticize profit maximization theory because of the existence of trade-offs between profit maximization and other households' goals. In addition, most of the economic studies on household decision behaviour in LDCs have shown that the markets in which the rural households operate are incomplete (missing) in many respects (Barrett, 2008). Thus, households differ in their accessibility to rural markets and other off-farm activities due to differences in transaction costs, rationing and entry barriers depending on their respective locations (Mendola, 2005). Therefore, modelling the farming household using this theory would not adequately capture the influence of transaction costs resulting from the government interventions on the market mechanism.

2.2.3 Theory of peasant economy

This theory originates from the Chayanov seminal work of the 1920s which emphasized on the influence of family size and structure on peasant economic behaviour. According to this theory, peasant farming households will tend to continue maximizing utility from family labour by working till they achieve the equilibrium between the increasing drudgery of family labour and the decreasing marginal utility of the goods produced (Mendola, 2005). Thus, peasants would put more efforts only if they have reasons to believe that such efforts would yield increased outputs which could be devoted to family consumption or to investment in the farm or to both (Chayanov, 1966). The theory assume the existing of the missing labour market and the unlimited supply of land and therefore, the optimum level of labour usage would vary across households in accordance to their demographic structures (Chayanov, 1966). Furthermore in the absence of labour market, the decisions of households are considered to be non-recursive because the family is left to decide on the percentage of its total available time to be devoted either on production or leisure

(Mendola, 2007). Based on these arguments, Chayanov ascertains that the decisions of the farming households on production and utility maximization would be more influenced by the size and the structure of the household in a non-recursive way.

Nevertheless, the assumption of missing labour markets and unlimited supply of land and or the perfect market condition are the main weaknesses of this theory. In reality however, farming households in the subsistence rural economy operate under market failures and exhibit dual decision behaviour of being both producers and consumers at the same time of their produce (Key *et al.*, 2000; Makhura *et al.*, 2001). Therefore, decisions on how much to consume may affect the production decisions made by the households. Thus, this is the gap which the non- separable agricultural household theory fills. The theory recognizes the duality behaviour of the farming households in making their production decisions.

2.2.4 Theory of agricultural households

Following the failure of theories of peasant behaviour by Chayanov (1966) and profit maximization in capturing the dual behaviour of farm households' decisions in developing countries (Singh *et al.*, 1986), the Agricultural Household Theory (AHT), a non-separable one was introduced by Strauss (1986) and De Janvry *et al.* (1991). The theory recognizes the dual behaviour of farming households in decision making as producers and buyers at the same time. The two authors are among the first authors to recognize the effect of market failures of smallholder farming in developing countries. This theory treats farming households as both consumers and producers, implying that most of their production decisions cannot be separated from the consumption decisions. Consequently, the produced commodities such as maize are consumed either entirely or partly and the remaining amount is sold in the markets at farm gate prices to obtain cash in order to meet their immediate household needs (Makhura *et al.*, 2001; Bwalya *et al.*, 2013). Therefore, the

farming household maximizes the utility by consuming home-produced and market-purchased goods, and maximizes leisure time subject to full income constraint and resources endowments (Bliss and Stern, 1982; Makhura *et al.*, 2001). In such situations, the consumption of goods and income affects each other. Therefore, the two sides are important in analysing decision-making processes of farming households.

According to scholars (e.g. Strauss, 1986; Bwalya *et al.*, 2013) the decisions made by the producing households on the production and market participation under market failure are also influenced by high transaction costs and other factors related to household and farm location characteristics. These factors among others include market price (shadow price) offered by traders at the village markets and which on the other hand depends much on the size of transaction costs which to some extent are contributed by NTBs. Thus, the increase of these transaction costs is expected to affect negatively the decisions of farming households to produce and supply more maize to the market. In contrast, a decrease in the marketing costs would encourage farmers to allocate more resources on maize production and thus increase its supply to the market.

Furthermore, as observed by Taylor and Adelman (2003), the key motivation behind agricultural-household analysis on policy analyses is based on comparative statistics with theoretical or parameterized models. For example, in analysing the dual decision behaviour of household in LDCs, a AHT presents all dependent variables (endogenous) as functions of exogenous variables such as prices of tradable output, farm assets, household time constraint and other household characteristics to obtain the relationship between variables (Taylor and Adelman, 2003).

Since markets in developing countries such as Tanzania are highly imperfect or in some cases are missing, this study is premised on the non-reparability of household production and consumption decisions. These assumptions were first introduced by Singh *et al.* (1986) and then advanced by other scholars such as De Janvry and Sadoulet (2010) and Taylor and Adelman (2003). Therefore, based on these arguments farming households are viewed as utility maximisers who are constrained by market conditions, income and transaction costs, as attributed to NTBs. These assumptions are used in this study as a benchmark in modelling farmers' market participation and supply decisions in Mbozi and Momba districts in Songwe region. In addition in order to capture the dual behaviour of households, the duality model was included in the derivation of the supply function used for the analysis of the effects of NTBs on maize supply. This is because under the dual (or reduced form) model, output supply and input demand functions can easily be indirectly derived from the profit function which satisfies the properties of convexity and monotonicity (Wall and Fisher, 1988).

2.3 Analytical Framework on the Effects of NTBs on Production and Price Received by Farmers and Traders

Janvry *et al.* (1991) and Sadoulet and de Janvry (1995) proposed theoretical explanations on the effects of transaction costs on prices under market failure. In their propositions, the existence of transaction costs on the supply of a particular commodity at the first point is said to affect market prices (both market and decisional ones) which in turn affect the amount of output produced and traded at the market. In this regard therefore, one of the major intentions of the protection policy such as the NTBs strategies is to influence prices both at the farm and consumer levels (Warr and Kohpaiboon, 2007; KI, 2011). Thus, their effects are more pronounced on the traded commodities and therefore are felt immediately by the one who access the market and gets involved in the trading activities.

In the LDCs where market failures are common, access to the market by farmers is limit as compared to access to the markets by their counterpart traders (Key *et al.*, 2000; Karugia *et al.*, 2009; Minot, 2010). Based on these arguments, traders could be the ones who would first feel the pinch of NTBs strategies through increased market costs and transaction costs. On the other hand, farming households that are directly producing agricultural produce rarely enter the market themselves as sellers due to limited market access, and thus they are indirectly affected by NTBs costs (World Bank, 2012; FAO, 2013). This is because in the rural areas, most of the farming households are said to be price takers and therefore they have to compensate traders from the already incurred transaction costs through lowering farm gate prices (KI, 2011; Minot, 2014). In such a situation, the surplus-producing household that sells agricultural produce at the farm level, would receive sales prices which are less than the observable market price (P^m), the different being the compensation on the transaction costs incurred by traders including the costs originating from NTBs (Markhura *et al.*, 2001; Bwalya *et al.*, 2013). Thus, the decision price for such a household as a seller would be less than the market price, which is smaller in the value equivalent to the transaction costs including those attributed to NTBs; and this is given as:

$$P_i = P_m - t_s \dots\dots\dots (1)$$

Where; P_i = is the decision price

P_m = is the prevailing market price

t = represents transaction costs including those from NTBs.

On the other hand, the deficit households that buy agricultural produce will buy at the purchasing price which is greater than the observable market price (P_m). Thus, the decision price for household as a buyer in such a transaction will be given as:

$$P_i = P_m + t_s \dots\dots\dots (2)$$

When buying households are faced with high transaction costs they tend to purchase fewer outputs as opposed to the time when are faced with low or no transaction costs (Bwalya *et al.*, 2013). It is therefore under this condition one can hypothesize that transaction costs resulting from NTBs are negatively related to market participation and the intensity to participate as they reduce the selling price.

Therefore, basing on the foregoing arguments, for country like Tanzania where market failure is common, the protection policy such as the NTBs strategies would directly involve traders who actually have access to the markets as sellers and would indirectly involve farming households who are rarely entering the market. Therefore, the effect of NTBs strategies at the farming households' level are said to be the derived effects. and these will depend on the degree to which these NTBs strategies are applied to traders in the market and on how the induced changes on their prices are then transmitted to prices actually which are received by farming households as the farm gate (Warr and Kohpaiboon, 2007). Changes in traders' prices at the urban markets as induced by the introduced NTBs are said to be compensated by farm households through lowering farm gate prices which are offered by traders (Gabagambi, 2013; Minot, 2014). The lowered farm gate prices due to NTBs costs would in turn discourage farmers from producing more maize and supply the markets with maize in future. Thus, the link between NTBs and production is reflected in the lower farm gate prices which are received by farmers when the government interferes with the market mechanism through NTBs strategies.

Therefore it is under this framework, that this study modelled the effects of NTBs on production and prices which are received by farmers in Mbozi and Momba Districts. In addition in order to capture the spatial effects of NTBs costs on the price difference

between rural and urban markets, the distance from the village to the district markets was used. This is because according to LOP and Meyer *et al.* (2009), the equilibrium price at the small market (at the rural) can be determined as the function of the equilibrium price in the dominant markets and transaction costs in the urban centres. Thus in this study, it was assumed that prices at the village markets were determined by the change in prices in the dominant markets in the urban centres. Thus, if the equilibrium price is less than the transaction costs of transporting the product between the two markets, trade is then disconnected and markets are said not to be integrated (Meyer *et al.*, 2009; Minot, 2010).

2.4 Determinants of Smallholder farmers' Market Participation Decisions

As discussed in sections 2.2 and 2.3, market participation with the exchange of output in the market is not cost free; it involves both observable and unobservable costs. It follows therefore that, the decisions of farm households to participate in a particular market are usually influenced by many factors which are related to socio-economic factors and transaction costs which arise from information inefficiencies and absence of formal markets. These transaction costs are often reflected by the difference between the perceived buying and selling prices (De Janvry *et al.*, 1991). In this respect, the decision price (P^i) which the farming households expect to receive may differ from the market price (observable price) due to transaction costs including those attributed to NTBs (Key *et al.*, 2000; Bwalya *et al.*, 2013). When these discrepancies in the prices occur, farming households as sellers receive low selling price and might, as a consequence be discouraged from selling more outputs, while buyers due to high buying prices may also be discouraged from buying more outputs (Makhura *et al.*, 2001). In a situation where the cost of transaction through market exchange creates a disutility which is greater than the utility gained by the market actor, the market would fail to exchange efficiently (Makhura *et al.*, 2001, Bwalya *et al.*, 2013).

Based on a study by Key *et al.* (2000), these transaction costs can either be fixed or variable. The variable transaction costs would vary with the level of transactions (variable transaction costs, VTC), but fixed transaction costs would be the same regardless of the level of the transactions. For example, the cost of searching for market information would be the same regardless of whether the household sells more or less of a particular commodity. These costs can be observable or unobservable but generally they are unobservable and are only revealed through actions of the market actors (farmers and traders). Furthermore, unobservable transaction costs can be explained by households' characteristics such as assets and information that can be observed (Sebatta *et al.*, 2012).

Likewise, transaction costs in the subsistence farming which arise from households' differential access to assets and information asymmetries would make different households experience different transaction costs (Bwalya *et al.*, 2013). For example, education and contact with extensions used as proxies for information represent fixed transaction costs, while ownership of arable land, livestock, and transport facilities represent variable transaction costs. Thus, the existence of transaction costs along the supply chain of a particular crop would tend to lower the price received by a seller and hence discouraging him /her from participating in the markets. Therefore, when a household decides to participate in the market, he/she would incur variable transaction costs and if he/she does not participate in the market he/she would only incur fixed transaction costs. Then, it follows that some farming households would participate in the market while others would not. In this context, farmers' decisions with regards to market participation under market failure could be explained well by using the theory of agricultural household under transaction costs which recognizes both the dual behaviour in decision making and the influence of transaction costs.

Similarly, market participation for maize smallholder farmers in Tanzania is highly influenced by multiple factors which are related to production as well as market costs and transaction costs (Mbise *et al.*, 2010; Sitko *et al.*, 2014). Such market and transaction costs, apart from transport cost, would include NTBs costs such as the costs which are derived from road blocks, weighbridges, local government permits, custom procedures, and other factors related to household characteristics. These costs are the ones which are difficult to measure and quantify. Therefore, their presence along the maize supply chain often leads to farmers being exploited by some middlemen or brokers given that all the costs involved in moving maize to the market are shifted to the farmers as compensation. This situation discourages many farmers' from getting involved in maize production and marketing (Rasmussen, 2009; Haug and Hella, 2013). Furthermore as Osebeyo and Aye (2014) argue, transaction costs including those attributed to NTBs can be used to explain why market failure is common especially in the LDCs. These transaction costs include those resulting from the distance to markets, poor infrastructure, high marketing margins, imperfect information, supervision, and incentive costs (Sadoulet and de Janvry, 1995; Makhura *et al.*, 2001).

In addition, the distance to the market together with poor infrastructure, poor access to assets and information are manifested in high exchange costs experienced by farmers. Therefore in order for farmers to participate in the market, they must determine who is it one wishes to deal with and what the terms are. They must conduct negotiations leading to a bargain, drawing up a contract, and undertaking the inspection needed to make sure that the terms of the contract are observed (Coase, 1937; Makhura *et al.*, 2001). The decisions as to which buyer to deal with and which price to accept, would depend on the distance to market a farmer has to cover. The longer the distance one covers looking for an ideal buyer,

the higher the search costs incurred, which are part of the transaction costs (Moctar *et al.*, 2015). These extra costs of searching for information may rise so high to the extent of exceeding the gap between the price at which one would be willing to sell (buy) and the price asked (offered) by the end user (Markhura *et al.*, 2001). High transaction costs might therefore prevent exchanges from occurring between two parties (i.e. the seller and the buyer) in a given market.

2.5 Empirical Analysis

2.5.1 Review on studies related to market participation for smallholder farmers

Increased market participation among smallholder producers has become a key concern in the area of agricultural transformation or commercialization. This is because market participation has the ability of unlocking smallholder farmers' productivity and access to markets and thereby increasing their income, leading to poverty reduction among poor farmers. In this regards, many studies have been carried out to examine different factors influencing households' decisions on market participation. These studies among others include Key *et al.* (2000) who used the agricultural household model to assess how the transaction costs influence different households when they enter the market as buyers, sellers and when they are in autarky among maize producers in Mexico. The study found that, the decision to produce maize among sellers was positively influenced by production shifters such as seeds variety, point of selling or buying, membership to farmer organization, access to formal credits, mechanization index and price among sellers. The study recommends that, interventions aimed at stimulating production for the market should ensure access to high yielding varieties and improved mechanization for increased market surplus among Mexican corn producers.

Makhura *et al.* (2001) on the other hand, determined factors that affecting commercialisation of small scale farmers in the former Kangwane area of Mpumalanga and Northern Province in South Africa. The study showed that factors related to assets, location factors, and household characteristics significantly affect the decision of farming households in participating in the markets. Similarly, Mduma (2003) employed the household model to analyse factors influencing market participation for smallholder farmers in Tanzania. The findings indicated that the decisions of farmers to participate in the market or not are determined by both farm and households' characteristics such as education, distance, acreage, age, family size, and market experience; but the study ignored the effects of NTBs related costs. Most of these studies however ignored the extra transaction costs that emerged from government interventions in the maize markets in the form of NTBs strategies. These NTBs costs are reported to constitute large percentage of unobservable transaction costs which are incurred by famers in the rural areas of LDCs.

In another study, Boughton *et al.* (2007) found out that ownership of cattle or donkeys for traction positively explained the probability of entering the market among tobacco producers in Mozambique. The findings from this study indicate further that, among maize and cotton producers, ownership of cattle or donkeys only influenced positively the intensity of market participation. In another study, Komarek (2010) evaluated the determinants of banana market commercialization in Western Uganda using a double hurdle approach. In the first hurdle the study determined what factors influenced the decision of the producer to enter the banana market (sell) using a Probit model. The study revealed that output price, yields, and access to price information prior to selling positively influenced the decision to enter the banana markets, while distance to the market negatively influenced the decision to enter the market. The study also highlighted the importance of price levels in motivating famers into entering the market and the importance of reducing

proportional transaction costs through reducing the distance to the market, which could leads to increased transportation costs. The study reported further that output price, yield, size of the household, ownership of land, and access to price information positively influenced the extent of market participation (extent) while off-farm income negatively influenced the intensity of market participation among banana producers.

Olwande and Mathenge (2011) evaluated market participation among poor rural households in Kenya using a double hurdle model. The study assessed factors that influence market participation among four commodity producers namely; maize, vegetables, fruits, and milk producers. The study reviewed that the factors that influenced market participation on each commodity varied within the country. In addition, the study found that being a member to a farmer organization, ownership of transportation asset and the region positively influenced the decision among maize producers of entering the market, while dependency ratio negatively influenced the decision of entering the market. However among vegetable producers, membership to a farmer organization, ownership of a cell phone, price and region positively influenced the decision of these producers of entering the market, while lack of formal education and distance to a tarmac road negatively influenced producers' decision of entering the market.

On the other hand, per capita income, land size, ownership of cell phone positively influenced fruit producers while lack of formal education negatively influenced fruit producers from entering the market. Furthermore, market participation among milk producers was positively influenced by price, membership to a farmer organization and education level of the household head. In contrast, age of household head and distance to a tarmac road negatively influenced milk producers' decision of entering the market. However, the intensity of market participation was found to vary among vegetable, fruits,

and maize producers. For example, distance to a tarmac road negatively influenced maize producers' decisions but positively influenced fruit producers' decisions. Output price was found to influence negatively the market participation decisions of fruit producers.

Jagwe (2011) evaluated the impact of transaction costs on the participation of smallholder farmers and intermediaries in the banana markets in Burundi, Democratic Republic of Congo, and Rwanda. The study used the Heckman two-step and found out that the decision to enter the banana market was positively influenced by the land size owned by the household, membership to a farmer group and access to credit. Also, the entry decision was found to be negatively influenced by ownership of a bicycle, access to price from neighbours and some geographical region. The study findings indicated further that intensity of market participation was positively influenced by the price, the number of children between the age of six and 17 years and ownership of a bicycle. The Inverse Mills' ratio was also found to be significant at one percent (1%), implying that the problem of selection bias was present between the two groups. Moreover, Sebatta *et al.* (2012) evaluated the determinants of smallholder farmers' participation in the potato market in Kabale and Mbale using a Heckman two-step model. The study found that the decision of entering the market was positively influenced by the condition of the road to the nearest market, age of the farmer and distance to the nearest market. On the other hand, intensity of market participation was positively influenced by output price, and the total farm land owned with the Inverse Mills' ratio also being significant at 5 percent.

Bwalya *et al.* (2013) estimated the effects of transaction costs on market participation of smallholder farmers in Zambia and found out that distance to the market and family size were negatively influencing farmers' market participation. The study indicated further that the level of education, the farmer's market experience and the size of land were found to be

positively related to the market participation. Sebatta *et al.* (2014) revealed similar findings among maize farmers in the Northern part of Nigeria.

Musumba and Costa (2015) evaluated the impact of marketing costs on maize supply in Tanzania using a spatial equilibrium model in the four major maize supply regions (Iringa, Mbeya, Rukwa, Ruvuma) and the four major deficit regions of Dar es Salaam, Mtwara, Dodoma, and Singida. The study findings indicated that high transportation costs in the Tanzanian maize producing regions affect considerably the supply chain efficiency of the local farmers. The findings from spatial equilibrium model indicated a gain in the prices and producers' welfare on the reduction in marketing costs throughout the producing regions.

However, none of the reviewed empirical studies included the transaction costs which are attributed to NTBs strategies despite their great roles they play on the rural households' decisions on production and marketing. In recognition of the roles played by NTBs, this study looked further back to the maize supply chain and assessed their effect on maize production and marketing in Mbozi and Momba Districts so as to shed light to policy makers and the government.

2.5.2 Review on studies related to the effects of NTBs on trade and marketing

Fugazza and Maur (2006) quantified the effects of NTBs on the international trade using data from the World Bank and the United Nations Conference on Trade and Development (UNCTAD). The study used Computable General Equilibrium Model (CGEM) in evaluating the effects of NTBs on exports at the global level. Their study however mainly focused on methodology questions related to the treatment of NTBs in CGE model with a special focus on the Global Trade Analysis Project (GTAP) model. In another study,

Ferrantino (2006) examined the effects of the Association of Southeast Asian Nations (ASEAN) and Sri Lanka's NTBs on India's exports and found out that the incidences of NTBs have been increasing and have thus limited the flow of India exports to Sri Lanka. The two studies also focused more on the cross border trade by dealing only with the effects of NTBs on import and export prices and ignored the effects of costs attributed to NTBs on production particularly at the farm household level.

In addition, Dean *et al.* (2009) estimated the price effects of NTBs for more than 60 countries cutting across 47 consumer products in 2001 using cross-sectional data in different products model to capture the imperfect substitutability between products. The model was estimated using an instrumental variables approach in order to incorporate the endogeneity of NTBs. However, the study considered the price effects on the exports rather than the effects on production and marketing which this study is considering.

Using a Spatial Equilibrium Model (SEM), Karugia *et al.* (2009) estimated the impacts of NTBs on cross border maize and beef trade in the EAC market. Their study identified roadblocks, police check points, bribes and custom rules and procedure as the main NTBs to trade in East Africa. Furthermore, the findings from SEM model indicate that 50% reduction on the cost of NTBs, or their complete elimination would improve the social welfare of farmers and traders in EAC. However, this study mainly focused on the cross border trade among EAC countries and ignored the effects of NTBs on local production and marketing especially their effects on prices and households' decisions on market participation which can be helpful in explaining why smallholder farmers in rural areas are not accessing district markets.

Okumu *et al.* (2010) examined the NTBs in EAC customs union and their implications on trade between Uganda and other EAC countries. The study concluded that there are several NTBs in existence and some have persisted in the EAC for a longer time than expected. The NTBs that are still persisting include customs documentation requirements, cumbersome formalities, un-standardized weighbridges, several road blocks, lack of recognition of individual country's standards, and the existence of several un-harmonized standards. Similarly, Minot (2010) also found out that in Tanzania, the presence of weighbridges, roadblocks, and bans on staple food supply channel forced some traders to sell their products to illegal markets across the country borders. The two studies also emphasizes more on the cross border trade between the member states within the EAC and overlooked their domestic effects on production especially in the surplus areas such as Mbozi and Momba Districts.

Porteous (2012) also investigated the impacts of export bans on agricultural markets using price data from 12 countries in East and Southern Africa over 10 years. By developing a structural model, the author showed that export bans do not have a statistically significant effect on the price differences between markets and that they (export bans) are correlated with equivalent price increases in both the country of destination and the country of origin due to the price surge on both sides of the border. Prices in the country of origin continue to track prices in the country of destination, despite that trade is cut off. The author concludes that export bans force traders to stockpile maize, causing prices in both countries origin and destination to rise higher than they otherwise would have been the case. Similarly, Dorosh *et al.* (2007) argue that government interventions in the form of NTBs such as export ban and subsidies can only keep prices of food and inputs low in the short run. But in the long run these may have side effects on markets and prices which could create disincentives

among farmers from increasing food production leading to shortage of food supply in the country.

Gabagambi (2013) conducted a cross-sectional survey on the impact of trade barriers on smallholder farmers in Kongwa and Karangwe Districts in Tanzania. Gabagambi's study found that maize farmers and traders have to pass through six road blocks along the way to Kibaigwa maize market in Kongwa District. At each road block, there is a considerable delay as farmers and traders have to show receipts but sometimes the post guards disagree with the quotations indicated on the receipts regarding the quantity of maize. Therefore, farmers and traders have to spend 1 to 4 hours to seek for clearance from all the road blocks established by local governments along to Kibaigwa market. To avoid such delays and related disturbances at road blocks, some farmers and traders resort to bribery whose cost ranges from TZS 3 000 to 5 000 for the 40 to 50 bags. Gabagambi's study only focused on the identification of the imposed NTBs which hinder the market access of smallholder farmers in the two districts (Kongwa and Karagwe). However, the exhaustive empirical analysis especially on the effect of NTBs on market participation and production is missing. This could be helpful in linking NTBs cost with the decline in maize production and marketing at the farm level especially in the major producing surplus regions in Tanzania such as Songwe.

From the foregoing literature review it can be deduced that most of the studies ignored the effects of NTBs on domestic production and marketing at the farm level especially in the surplus area such as Mbozi and Momba Districts. This is because the imposed NTBs do not only influence cross border trade, but they also indirectly affect the production and marketing at the lower level of the maize supply chain in the local markets (i.e. at farm level). It is within this background this study intended to fill this gap of knowledge by

providing explicit empirical information to policy makers and the government regarding the effects enforcing food availability and security in the country using NTBs strategies.

2.5.3 Review of approaches for measuring the effects of NTBs

Various methods have been developed and suggested in estimating the economic effects of NTBs in economic literatures. Researchers have used many frequency measures to capture the scope and potential effects of NTBs across countries and industries as well as over time (Okumu and Nyankori, 2010). For example, Ardakani *et al.* (2009) surveyed four measures of identifying and estimating the effects of NTBs on trade. These methods include frequency and coverage type, price-comparison, quantity-impact, and welfare-impact. In addition, Anne-Celia *et al.* (2007) provided a brief survey of different measures or methods, which have been suggested in the literature of identifying and estimating the effects of non-tariff barriers to trade. These measures include: frequency and coverage indexes, quantity-impact, price-comparison, and price effect using import demand elasticities. On the other hand, Beghin and Bureau (2001) provided a comprehensive review of the approaches which are used in assessing the impacts of NTBs on agricultural trade. The authors categorized the approaches into eight groups; i) the price-wedge method, ii) inventory-based approaches, iii) survey-based approaches, iv) gravity-based approaches, v) risk-assessment-based, vi) cost-benefit measures, vii) stylized microeconomic approaches, and viii) the use of sectoral or multimarket models. The brief explanations of each approach with its limitations are given hereunder.

i) Price wedge approach

This approach uses the price differences between the import price and the domestic price of each commodity at a disaggregated level. The result from price difference is treated as NTBs termed as *ad valorem* equivalent (Fugazza and Maur, 2006). The usefulness of this

method is that it is easy to estimate and it enables a quick understanding of the existing situation regarding the instituted NTBs. However, the price-wedge method has several limitations which include the difficulty in identifying precisely what these NTBs are and the formulas that measure NTBs in an implicit way. This is because the percentage price wedge between imports and domestic prices are valid only under the assumption that the imported goods are perfect substitutes. In reality however this situation rarely exists in LDCs such as Tanzania and thus, the price differential could not convey true information about how the NTBs operate in practice (Beghin and Bureau, 2001). Other shortcomings of this approach include difficulty of obtaining the corresponding price which is prevailing in the domestic market especially at a fairly disaggregated level and therefore it needs more data especially in the study which involves larger sample and where the available data are often too aggregated to reflect the differences in the quality of the imported goods (Deardorff and Stern, 1997). Generally, frequency measures provide little or no information regarding the actual effect of NTBs on import quantities, prices, or trade.

ii) Inventory-based approaches

Inventory-based approaches have been commonly used for analysing the impact of NTBs on trade flow from both quantitative and qualitative perspectives. Also, these approaches have been useful for studies which focus attention on the frequency of occurrence and the production coverage of various types of NTBs. These approaches use the number of regulations and pages of the policy which are then used in constructing various statistical indicators or proxy variables. Moreover, frequencies of detentions and complains from the traders over discriminatory regulatory practices and notifications to international bodies about such practices are also used as proxy to trade restrictiveness (Fugazza, 2013). However, the major limitations and weaknesses of these methods are as follows: they do not provide a clear quantification of the effect of regulations on trade per se and therefore

they need large data to develop proxy variables. On the other hand, the number of pages of domestic regulations is not a good measure for trade restrictiveness of the overall regulatory set. Therefore, these methods could not be suitable for NTBs which are introduced arbitrary and in an Ad Hoc manner such as road blocks, export bans, and council permits.

iii) Gravity-based approach

The gravity approach of trade has also been used in the estimation of the impact of NTBs on trade flow across countries. The gravity-based approach involves estimating the gravity equation with residual errors which are treated as the effect of NTBs on trade. It quantifies the effect of NTBs on trade flows across countries in a specific product or industry. Even though, this method provides exhaustive analysis in terms of industry coverage, it is restricted to the number of countries involved in the trade (Beghin and Bureau, 2001). Also, the residual errors which are treated as NTBs costs could not necessary represent NTBs, since there may be other factors than NTBs which may be responsible for residual errors.

iv) Trade restrictiveness index

This approach is commonly used in measuring changes of welfare resulting from policy changes over time (Fugazza, 2013). It provides a single number that characterizes the overall effects of a country's trade policies that apply to a particular aggregate of goods under general equilibrium conditions. However, the method requires huge data on import and export prices in developing the indexes and which rarely exist in the developing countries such as Tanzania because of information asymmetry (Devadoss *et al.*, 2005; Fugazza and Maur, 2006). Therefore, its application in such countries could not give a true picture of the effects of NTBs on production and trade.

v) Risk assessment-based cost-benefit approaches

Risk assessment approaches appear to be far removed from the measurement of NTBs effects because of its complexity in computing the willingness to pay. However, these methods have been coupled with cost-benefit calculations and indirectly contribute to the measurement of the effect of regulations such as NTBs. Together with quantifying the actual impact of this measure on trade; they also provide some indications of what should be included as trade barriers which are based on the effect on welfare. The main advantage of these methods is their ability to combine the use of scientific and cost-benefit assessment for identifying and assessing the costs and effects of NTBs using the willingness to pay method. However, the main limitation of this approach is the uncertainty that surrounds the level of risks and economic consequences. Clearly, the validity of the cost–benefit analysis depends on how correctly the willingness to pay is computed (Fugazza, 2013). This can be quite challenging to compute especially in LDCs where markets are frequently intervened by governments. In this regard, the method can only accommodate the impacts or effects of the implemented NTBs but overlooks the welfare impact of reducing NTBs.

vi) Stylized macroeconomic approaches

Under these methods, the effects of NTBs are estimated by observing the displacement of the market equilibrium prices which are induced by a policy or a regulation imposed on the marketing of a particular product (Fugazza, 2013). The change in equilibrium prices is considered as the effects of the introduced NTBs policy. These methods are only useful in assessing how much trade is forgone because of regulations, how extensively consumer preferences are affected and what are the effect of harmonization of regulations versus mutual recognition agreements. The major disadvantage is that the analytical framework becomes rapidly intractable unless drastic simplifying assumptions are made (Fugazza, 2013). Also, the method focuses more on quantitative effects of NTBs on trade and thus

ignores qualitative side which can give a clear picture of the imposed NTBs in a given country. This limitation makes the method to be rarely used in measuring the effects of NTBs on Trade.

vii) Quantification using sectoral or multi-market model

This approach relies on modelling frameworks which provide a framework for analysing tariff rate equivalents of standards and technical regulations, which are imposed on the flow of commodities across countries. The main advantage, when compared to gravity model is that it is possible to assess not only the impact of regulations on trade flows but also on the welfare that is associated with the NTBs. Also, when they are compared to stylized approaches that focus on qualitative effects, partial equilibrium models provide more quantitative results.

Thus, partial equilibrium models are useful methods for estimating welfare effects of regulations such as Sanitary and Phytosanitary (SPS) or Technical Barriers to Trade (TBT) measures. The major limitation of this method is that the quantification of trade and welfare effects of SPS and TBT regulation requires taking more precaution on sophisticated mechanism related to imperfect competition or consumer information. The analytical ambiguity of the impact of technical measures (SPS or TBT) on international trade calls for a more careful empirical quantification and identification of the trade effects of these measures (Fugazza, 2013). This method is therefore not considered relevant in measuring barriers which are difficult to measure such as administrative procedures and in the case where information is limited. Thus, for a country such as Tanzania where markets in the rural areas are imperfect in most cases, the application of this method could be challenging. This is because of the shortage of enough information regarding to the implementation of NTBs.

viii) Survey-based approach

This method uses data from a survey conducted among exporters and importers to find out various types of NTBs faced during the export and import of commodities among countries. Moreover, in the absence of information from other sources, survey-based methods could be useful as it is possible to identify barriers which are difficult to measure (for example, administrative procedures). Surveys can also be designed to provide some information (such as ranking the importance of the measures or barriers on a scale) that can be used in econometric studies. Another useful feature of the survey-based approaches is the ability of identifying and diffusing hardly measurable barriers, such as the administrative ones. Moreover, Survey-based methods also indicate the regulations which are of more concern for the industry and not always those which economists would have thought of and perhaps attempted to include in their models (Beghin and Bureau, 2001). However, the major shortcoming of this method is that it is a costly approach and requires special skills in designing and administering it, otherwise it could lead to weak results.

From the above reviewed approaches, it is apparent that most of these approaches are only more relevant for analysing the impacts or effects of NTBs on trade and welfare across countries and regions (i.e. international trade). Most of them require huge data on import and export prices, making them more relevant for analysing the effects of technical barriers such as SPS and TBT. However, methods that are focusing on quantifying NTBs costs and their effects on production and market participation at farm households' level especially in LDCs rarely exist. This is because in the context of LDCs, where market failures frequently prevail, the estimation of NTBs costs and their corresponding effects on prices and production are difficult to construct because of lack of enough good data (Karugia *et al.*, 2009; Fugazza, 2013).

To overcome these challenges, scholars (e.g. Karfakis and Rapsomanikis, 2008; Karugia *et al.*, 2009) suggest the use of standardized comparable unit method which has the ability of quantifying the cost from various types of NTB in comparable units such as the money paid by traders as a bribe in order to get passed the barrier created by NTBs. Also, accommodation and meals as proxy of time wastage due to queues at the customs or weighbridges are one among the suggested methods of quantifying NTBs. This method enables researchers to quantify and estimate the costs paid by farmers and traders in clearing NTBs obstacles at different level of the supply chain of a give product.

Therefore, this study also adopted the standardized comparable unit method in estimating the costs and effects of NTBs on maize production and marketing in the study area. This is because the study was not focused on international trade which does involve the flow of commodity across country' borders. Rather the study intended to assess the effects of NTBs strategies on the domestic maize production and marketing at the farm level in Mbozi and Momba Districts of Tanzania. Thus, the method was deemed suitable in this study as it enables the researcher to estimate the unobservable NTBs costs in proxy ways. The standardized comparable unit which was used in the quantification of costs from various types of NTBs is presented in Table 1.

Table 1: Measurements of the cost due to NTBs

Variable	Quantification measurements
Administrative requirements	Amount paid in TZS to obtain licenses, custom clearance, council permits.
Roadblocks	Monetary cost in TZS per ton to overcome the roadblock barrier; time lost per trip due to roadblocks, frequency.
Duties/Levy	Amount paid in TZS per ton per trip
Weighbridge	Frequency, time lost at weighbridge; monetary cost in
Police check point	TZS/ton to overcome the barrier per trip.
Custom procedures	Time lost due to queues at custom, monetary cost paid in TZS/ton per trip to overcome any barrier at custom

Source: Adopted from Karugia *et al.* (2009)

2.6 Factors Affecting Maize Production in SSA

Literature identifies three classes of constraints facing farmers in their crop production in SSA (Urassa, 2010): These classes include farm related, household related, and those related to location. The farm related constraints include small farm size, low soil fertility; poor technologies used in production, high weeding intensity, and low access to agricultural extension services (Larson and LeO'n, 2006; URT, 2007). As argued by Bisanda *et al.* (1998) and Kydd *et al.* (2004), easy access to modern inputs such as chemical fertilizers, improved seeds and pesticides by smallholder farmers is an important ingredient for higher outputs and production per unit labour and/ or land. Moreover, Cerdan-Infantes *et al.* (2008) reported that availability of agricultural extension services to farmers is an important tool of increasing production and productivity. This is because extension services are aimed at transferring specific knowledge to producers such as technology and improvement of crop management practices. In this respect, Urassa (2010) reports that the promotion of the use of chemical fertilizers made by extensions in the Northern zone of Tanzania led to a rise in smallholder farmers' maize yields ranging from 4.5 to 5.1 ton/ha, the quantity which is higher than the national average yield of 1.3 ton/ha.

On the other hand, household related factors such as the age of the household head, education level, gender, family size, and income were reported to have an influence on households decisions related to production and marketing of agricultural outputs. For example as reported by Pender and Gebremedhin (2007) smallholder farmers with high education were in a better position in accessing non-farm income and credit and thus could be able to purchase inputs and produce more outputs for consumption and market. Additionally, Govereh and Jayne (1999) observe that matured household heads in Zimbabwe showed high crop productivity as compared to younger household heads. This

was because of greater experience matured household heads had in crop production and the accumulated social capitals which reduced the searching and bargaining for prices costs with inputs traders. However, the influence of gender was extensively reported in the studies by Pender and Gebremedhin (2007) and Urassa (2010) who revealed that female-headed households in Ethiopia and Tanzania used significantly less labour and draft power due to labour constraints and cultural taboos against women. On the other hand, the size of households was reported to have paramount effects on the amount of outputs to be produced and supplied by the household. For example, Urassa (2010) and Bwalya *et al.* (2013) revealed that households with large numbers of people were able to produce and supply more maize outputs in Nigeria and Tanzania compared to those with fewer family members.

In addition, farm location characteristics can determine the types and amount of crop produced by farmers and it is highly related to the nature and condition of infrastructures which are available in the rural areas. Findings by USAID (2005) and the World Bank (2008) indicate that inadequate transport infrastructure and other services in rural areas in Africa increase the transaction costs and hence undermine smallholder farmers' access to the local markets and export of commodities to other countries. These observations are in line with those made by Urassa (2010) and Busumba and Costa (2015) that high transportation costs in Tanzania affect considerably the supply of maize from the major producing regions in the Southern Highland to the major consumer markets in Dar es Salaam. This situation could create food security threats in the country in future given that about 40% of the maize produced in Tanzania comes from these big six maize producing regions in the Southern Highlands (World Bank, 2009; FAO, 2013).

2.7 Effects of NTBs on maize Supply and Trade in SSA

The economic effects of NTBs have continuously been receiving a great deal of attention in the literature. It is observed that with the decrease in tariffs under multilateral and bilateral trade agreements and other barriers to trade in the form of NTBs have been in the rise in the recent years (Kissel, 2006; Minot, 2010). They have gained prominence as alternative trade policy instruments for domestic industry protection or for regulating trade. Despite the overall perception of liberalized food markets in the world, governments in SSA have continued to interfere heavily with staple food markets particularly in the times of rising food prices (World Bank, 2012; Haug and Hella, 2013). The experience in many countries shows that tariffs are reduced while NTBs are increased as they are seen as one of the ways in which governments can collect revenue (Nganga, 2014). The increase in NTBs in most countries has created unfavourable environment for staple food trade. Studies (e.g. Bwalya *et al.*, 2013; Sebatta *et al.*, 2014) indicate that higher transaction costs experienced by small scale farmers in Zambia and Uganda included those resulting from government interventions in the form of NTBs policies hampers the participation of farmers in the market activities. Moreover, the findings from a study by Okumu and Nyankori (2010) indicate that Uganda's maize exports to the EAC region face various NTBs which include several non-standardized weighbridges and many internal road blocks, and the traditional NTBs such as SPS requirements. These NTBs limited the movement of agricultural produces from one market to another in the country.

2.8 Effect of NTBs on Prices between Markets

The effects of NTBs on prices are actually reflected through price transmission between markets within a country or between countries (Van Campenhout, 2007). Price transmission, according to Minot (2010), refers to the effect of change in prices in one market on the prices in another market. It serves as a signal of well-functioning and

efficient markets between two locations (Abidoye and Labuschagne, 2012). Generally, price transmission can be measured by the level of transportation cost, trade barriers, and lack of market information or uncompetitive markets. In this respect, FAO (2009) indicates that a full transmission of price shocks can indicate the presence of well-functioning market, while the total absence of transmission may indicate market inefficiency or failure. However, protectionist policy instruments such as NTBs, which tend to be imposed by Governments on a discretionary and ad-hoc basis, may lead to less involvement of the private sector due to unpredictable market and thus hampering the long-term market development and price transmission (Gabagambi, 2013).

Moreover, as Minot (2010) argues, the presence of weighbridges, roadblocks, and export bans on food staples supply channel may force traders into selling their products to illegal markets across the country borders. A similar reasoning holds true at the household level, where high transfer costs due to distance, poor infrastructure, and other factors may generally limit their market access and opportunities (Karfakis and Rapsomanikis, 2008; Mbise *et al.*, 2010).

2.9 The Conceptual Framework

The conceptual framework for this thesis is presented in Figure 2, which provides the guidance for the study. This framework provides the relationship and direction of the effects of NTBs on the decisions of farmers and traders on production and trade. The linkage between different variables was drawn from theoretical background and literatures as reviewed in the previous sections. However, the study hypothesized that NTBs affect negatively the market prices through increased transaction costs particularly in the rural markets. On the other hand, the government in response to a change in prices and food shortage in the local and world markets as result of climatic threats and other factors, is

forced to implement many NTBs such as export bans, weighbridges, and roadblocks as strategies of offsetting these problems. The imposed NTBs are hypothesized to influence both the market prices and farmers' decisions on maize production and marketing.

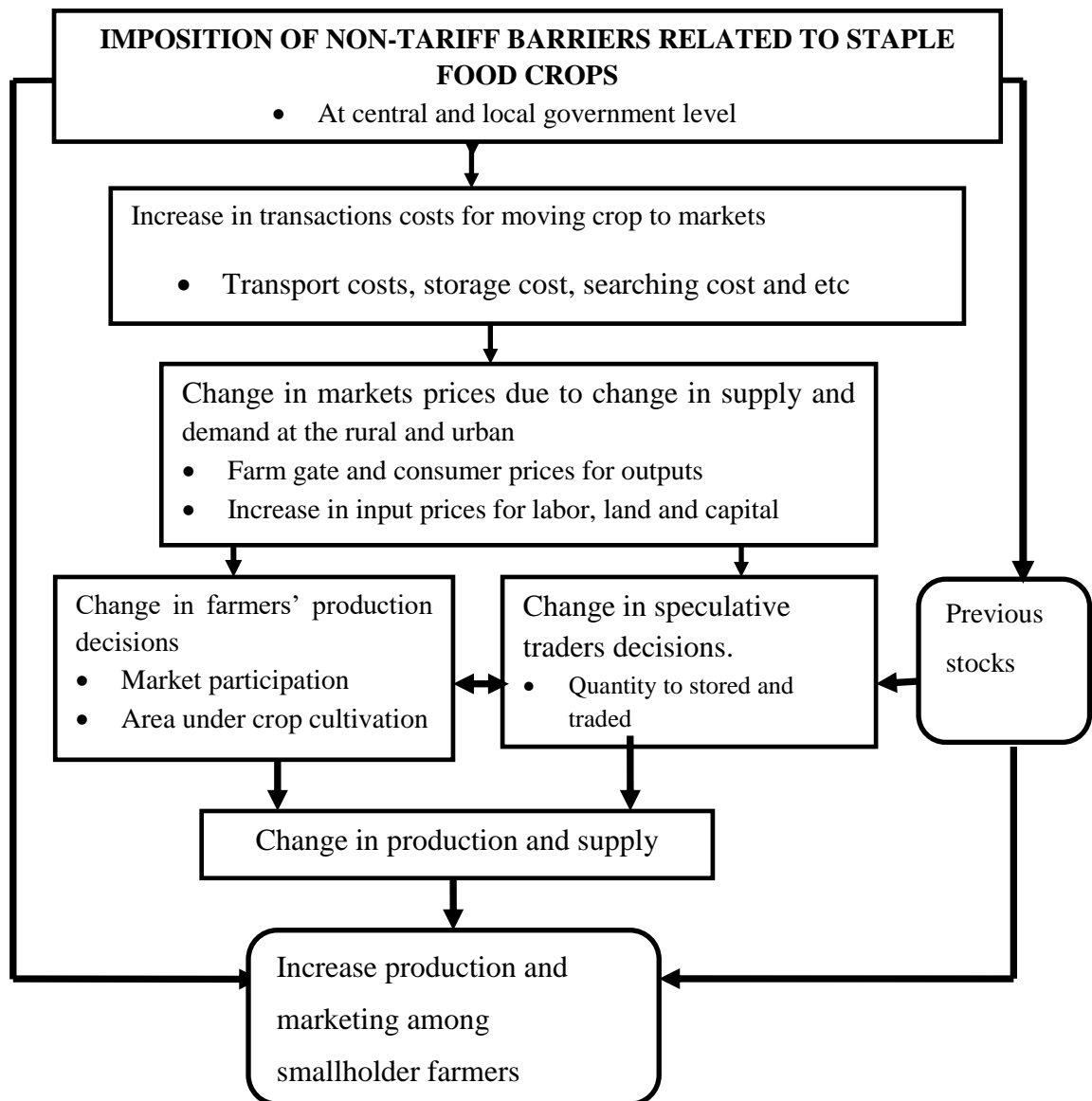


Figure 2: The conceptual framework for the effects of NTBs on maize production and marketing

Key: → Direction of effects/change

In contrast, application of NTBs as argued by Karugia *et al.* (2009) does increase the size of marketing costs and thus leads to high consumer prices and low prices received by

producers. This also could influence markets efficient which acts as an incentive of increasing produce of both producers and traders (USAID, 2012; Gabagambi, 2013). On the other hand, the size of the beginning stocks which are available in the warehousing of traders will also influence the speculative prices and stored quantity and thus the supply of the said crop by traders.

The effects of the imposed NTBs are felt by both traders and producers at different levels along the supply chain. In the first incidence, they are felt by traders and then these effects are transmitted to farmers in the form of lower farm-gate prices received by farmers from traders. Given that farmers' decision on future production and marketing are based on the current and previous prices, a change in the market prices which are caused by the imposed NTBs at both rural and urban markets will make producers and traders to respond by adjusting their quantity supplied or produced and demanded. Thus, the lower market prices will reduce t farmers' incentives of producing more outputs, which in the long run, would hurt the net maize buyers in areas of deficit as maize output would be kept below its potential demand (World Bank, 2009; KI, 2011). Therefore, if prices continue to decline farmers would reduce their production and supply of maize to the markets.

Therefore, some farmers would be tempted to diversify their production to other crops such as sunflowers and groundnuts, which are not under restrictions. Similarly, private traders (both local and regional) who are involved in the speculative storage and sell when the price go up, would , in the presence of government intervention in the form of NTBs, also adjust their demand and supply function in terms of the quantity traded and stockpiled to accommodate the effects created by NTBs costs. This process could lead to shortage of food in the market in the long run and thus negatively affect the welfare of producers and traders. As a result, the instituted NTBs policy may have the opposite effect of what the

policy intend; in the long-run maize prices in the deficit areas might be higher as a result of a lower aggregate maize supply.

3.0 METHODOLOGY

3.1 The Study Area

The study was conducted in the Southern Highlands zone of Tanzania covering two major surplus maize producing districts, namely Mbozi and Momba in Songwe region. Mbozi and Momba Districts were selected because of their agricultural potential of being surplus-producing areas for maize in Songwe region. The two districts account for about 50% of the maize produced in Songwe region and 40% of the maize from the two maize producing regions of Songwe and Mbeya (KI, 2011; NBS, 2008). Furthermore, the two districts are also located far from major domestic consumer markets such as Dar es Salaam and Arusha. Therefore, involving them in the study was considered useful in obtaining more information related to spatial effects of NTBs on the price and market participation for surplus farmers.

On the other hand, the two districts share borders with Ileje District in the south but Mbozi which is in the Eastern side shares borders with Mbeya District and Momba District on the west. In the North, Mbozi shares borders with Chunya District. Momba District in the north extends to Lake Rukwa whereas to the West it shares borders with Rukwa Region and the Republic of Zambia. The two districts occupy a total area of 8 675. 26 km² among these 79.2%, which is equivalent to 6 870.8 km² comprise arable land, 9.7 percent (841.5 Km²) is forest reserve, 8.1 percent (702.7 km²) is for settlement and other uses, and the remaining 3 percent is covered by water bodies (NBS, 2014).

The agriculture and livestock sectors in Mbozi District constitute the mainstay of the economy in providing income, employment, and ensuring adequate food supplies for her population which is estimated at 446 339 people (NBS, 2014). Mbozi District also is famous for the production of both cash and food crops. Cash crops produced in Mbozi District include Arabica coffee and cotton while food crops include maize, rice, beans,

millet, sunflower, and cassava (KI, 2011; NBS, 2014). On the other hand, the population of Momba District is estimated at 196 818 in the year 2012 (NBS, 2014). However, only a small number of the population in the two districts was engaged in commercial and industrial production. The latter is still limited to small scale enterprises which include maize mills, brick making, carpentry, and tailoring whom are mainly found at Vwawa, Mlowo, and trading centers of Iyula, Igamba, Ihanda and Nyimbili in Mbozi District. On the other hand, Mpemba, Tunduma, Msangano and Ndalambo are the major trading centers in Momba District.

In Songwe region, Mbozi and Momba Districts are claimed to be the granary of the regions' staple food as the two districts produced more than 50% of the total maize production in the 2013/2014 agricultural season (NBS, 2014). In addition, more than 50% of the total regional coffee production comes from Mbozi District. Other crops grown in the two districts include sunflower, tobacco, cotton, paddy, sorghum, finger millet, sweet potatoes, and simsim. Livestock keeping is ranked second most important economic activity in these districts, though its actual contribution to the districts' economy in terms of income, employment, and Gross Domestic Product (GDP) and per capita income is yet to be accurately assessed (KI, 2011, NBS, 2014). Figure 3 shows the two districts of the study area.

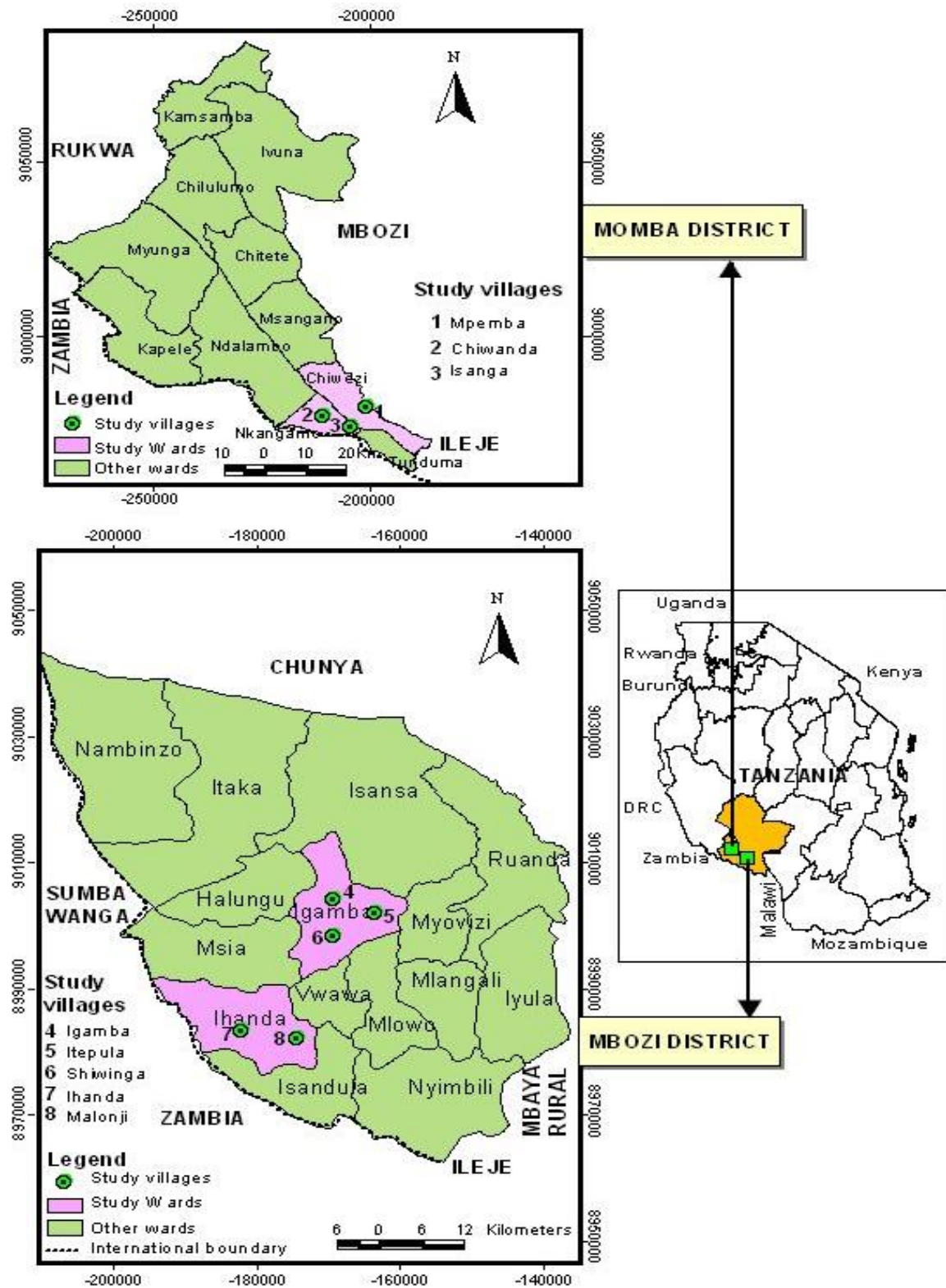


Figure 3: Map showing study wards and villages in Mbozi and Momba districts in Tanzania

3.2 Analytical Methods

3.2.1 Market participation equation for farm households

According to Barrett (2007), households face a two-step decision making process with regards to the market participation. The first step involves deciding whether or not to participate in the market while in the second step, the household has to decide on the quantity to sell in the market (extent of market participation). However to analyse market participation, this study has employed the Agricultural Household Model (AHM) as proposed by Key *et al.* (2000) and Bwalya *et al.* (2013) frameworks. In modelling the two stages of decisions by households, it was assumed that households are facing both fixed and variable transaction costs and NTBs costs as an extra transaction costs resulting from government intervention on the market in their attempt to participate in the markets. Thus, a farm household has to decide on how much of good i to consume (C_i), produce (q_i) and to use as inputs (X_i) in the production process. In addition, he/she will also has to decide on how much of good i^{th} to sell to market (S_i) and that, his/ her decision to participate into the markets will depend on the level of utility that is derived from that market exchange.

Moreover, the decisions of households on market participation in this study were modelled under three conditions; in the first condition, householder farmers make their decisions without considering transaction costs, secondly, householder farmers make their decisions under normal transaction costs under the absence of government intervention through NTBs strategies; and thirdly, farmers make decisions under the government intervention condition in which NTBs costs are considered as extra costs to the households.

In the first instance, it was assumed that households make their decision on market participation without considering transaction costs (as autarkic) and thus the objective of

households would be to maximize the utility function subject to cash, resource balance, and production technology constraints as:

$$MaxU = u(C_i, Z_i; H_u) \dots\dots\dots (3)$$

Where C = Amount of produce which consumed by household from what produced

Z = Amount of produce purchase by the household as a buyer

H_u = Presents households socio-economic characteristics which can shift the utility function

The above equation (3) indicates that a household can either consume what it produces (C) or gain revenue to purchase other goods (Z), given household characteristics (H_u).

Thus, the household's utility function will be maximized subject to cash constrain and will be expressed as:

$$\sum_{i=1}^n [P_m C_i + Z_i] \leq \sum_{i=1}^n [P_m (q_i - S_i) + TE] \text{ (Cash constrain).} \dots\dots\dots (4)$$

Where P_m = Market prices of the output

Equation (4) above implies that, expenditures on all purchased goods (Z) must not exceed the revenue from sales (S_i) and transfers (TE) (e.g. remittances).

For resources balance the equation is given as:

$$P_i C_i + P_i S_i + P_i X_i \leq P_i q_i + Z_i + TE_i \text{ (Resource balances)} \dots\dots\dots (5)$$

The equation (5) indicated that, the amount consumed (C) for commodity *i*, what was used as inputs (X) and that were sold (S) must be equal to what is produced and bought by a household (Z) plus the endowment of a good (TE).

And for production technology

$$G = g(q_i, X_i; H_q) \text{ (Production technology constrain)} \dots\dots\dots (6)$$

This presents production technology related to input use (X_i) and to output produced (q_i), given the set of households' farm characteristics (H_q).

Given that, $C_i, q_i, S_i, Z_i \geq 0$ (None negativity condition)

and

$$Z_i = P_i S_i \text{ and } S_i = f(C_i, q_i; H_q; H_u, TE_i) \dots \dots \dots (7)$$

Whereby: P_i is the market prices for good i and purchases of input i respectively.

The second condition is when transaction costs (both variable (t_v) and fixed (t_f)) are considered and included in the model. The presence of transaction costs will tend to raise the effective price paid by a buyer and lower the price received by a seller (Mbise *et al.*, 2010). Thus, the decision price (P_i) for household under such conditions is given as:

$$P_i = P_m - t_v^s - t_f^s \quad (\text{As a seller}) \dots \dots \dots (8)$$

$$\text{And } P_i = P_m + t_v^b + t_f^b \quad (\text{As a buyer}) \dots \dots \dots (9)$$

Whereby households will pay t_v^s and t_f^s as variable and fixed costs if they sell, and t_v^b and t_f^b if they buy goods respectively.

Furthermore in this study, the unobservable transaction costs which are paid by households were expressed by observable household characteristics (h_t^s) for the net producers (seller) and (h_t^b) for the net buyers. Thus, these transaction costs in terms of households' characteristics were stated as:

$$t_i^s = -\beta_i^s h_t^s \quad (\text{Transaction cost for household as seller})$$

$$t_i^s = -\beta_i^b h_t^b \quad (\text{Transaction costs for household as a buyer})$$

Therefore, the households' utility objective function (3) under transaction costs subject to cash constrain become:

$$\sum \delta_i [P_m - t_{vc}^s(h_t)](q_i - S_i) - \delta^c Z' - \delta^c [P_m + t_{vc}^c(h_t)]C_i - \delta^s t_{fc}(h_t) - \delta^c t_{fc}(h_t) + TE_i \geq 0$$

..... (10)

Whereby; δ_i^s is the revenue gained by the householder under the transaction costs

S_i = the amount sold, given that $\delta_i^s = 1$ if $S_i > 1$ and $\delta_i^s = 0$ if $S_i = 0$.

Then, from the equation (10), supply and demand equations were derived given that the household is facing both fixed and variable transaction costs using Langrangian equation. Thus, the Langrangian equation is given as:

$$Max L_u = U_i(C', Z' : H_u) + \mu \sum \delta_i [P_m - t_{vc}^s(h_t)](q_i - S_i) - \delta^c Z' - \delta^c [P_m + t_{vc}^c(h_t)]C_i - \delta^s t_{fc}(h_t) - \delta^c t_{fc}(h_t) + TE_i \geq 0 + \lambda [P_i(q_i - S_i) - P_i C_i - P_i X_i + Z_i + TE_i] + \omega G(q_i, X_i : H_q) \quad \dots\dots (11)$$

Whereby; μ, ω , and λ are the Lagrange multipliers associated with cash constrain, the resource balance and the technology constraint, respectively.

The above conditions imply that when the household decides to participate in the market, he/she will incur variable transaction costs and if they do not participate, there would be no variable transaction costs. Therefore, the fixed transaction costs (t_{fc}) will determine whether or not the household decides to supply and participate in the market (Makhura *et al.*, 2001).

However, the inclusion of transaction costs in the Langrangian equation will create discontinuities and thus the optimal solution cannot be found by simply solving the first order conditions (FOC) (Key *et al.*, 2000). The solution has to be decomposed in two steps as postulated by Makhura *et al.* (2001) and Bwalya *et al.* (2013); first solving for the optimal solution conditional on the market participation regime (as a seller or buyer), and

then choosing the market participation regime that leads to the highest level of utility. Thus, using the optimum condition on market participation for a household facing transaction costs in equation (11), the supply and demand equations can be derived by solving the first order condition as follows:

For consumption of own production

$$\frac{\partial u}{\partial C^t} = \mu \delta^c [P_m + t(h_t)] + \lambda \delta^c [P_m + t(h_t)] \dots\dots\dots (12)$$

For consumption of purchased goods

$$\frac{\partial u}{\partial Z_i} = \mu \delta^c [P_m + t(h_t)] - \lambda \delta^c [P_m + t(h_t)] \dots\dots\dots (13)$$

For output produced

$$\omega \frac{\partial G}{\partial q_c} = -\mu \delta^s [P_m - t(h_t)] - \lambda \delta^c [P_m - t(h_t)] \dots\dots\dots (14)$$

For inputs used in production

$$\omega \frac{\partial G}{\partial X_i} = -\lambda \delta^s [P_m - t(h_t)] \dots\dots\dots (15)$$

For marketed goods (Sold goods)

$$\omega \frac{\partial G}{\partial S_i} = -\mu \delta_i^s [P_m - t(h_t)] - \lambda \delta_i^s [P_m - t(h_t)] \dots\dots\dots (16)$$

However, if the effects of variable and fixed transaction costs on the households' decision price (P_i) are considered, then the equations for market participation of households as sellers and buyers will be expressed as:

$$P_i = P_m - t_{vc}^s - t_{fc}^s \quad \text{if } S_i > 0 \text{ as seller and } P_i = P_m + t_{vc}^s + t_{fc}^s \quad \text{if } S_i < 0 \text{ as a buyer} \dots\dots\dots (17)$$

Using the decision prices p_i and the first order conditions, utility maximization subject to the technological constraint leads to a system of output supply equations $q(p, h_q)$ and input demand equations $x(p, h_q)$. Thus, considering the utility maximization function subject to the income constraint can lead to a system of demand equations for consumer goods $c(p, I, hu)$.:

Thus, the supply equation for a selling and buying household under transaction cost is given as:

$$q_i' = q' \left(P_m - t_v^s - t_f^s; h_q \right) \text{ for a seller..... (18)}$$

$$q_i' = q' \left(P_m + t_v^b + t_f^b; h_q \right) \text{ for a buyer.....(19)}$$

$$q_i' = q' \left(P_m h_q \right) \text{ for autarkic households.....(20)}$$

The third condition is where the government imposes NTBs on the marketing of i^{th} good, under such situation, farmers and traders will have to incur an extra variable transaction costs (R_t) resulting from the introduced NTBs obstacles above the normal variable and fixed transaction costs. These are the costs, which farmers and traders had already incurred in searching, negotiation, monitoring, and enforcement of their contracts. These extra costs resulting from the introduced NTBs will further lower the price received by household as a seller and raise the price paid by a buyer. Basing on these observations, the decision price (P_i) for household as a seller will be modified to incorporate the NTBs costs and the new equation is given as:

$$P_i = P_m - t_v^s - t_f^s - R_t \text{ (21)}$$

Where; P_i = decision prices`

P_m = market price

t_v and t_f = Variable and fixed transaction costs respectively

R_t = NTBs cost equivalent

From the above equation (21), if the observable market price (P_m) of good i^{th} is greater than the decision price (P_i) (unobservable price), the household will participate in the market and a positive amount of sales would be observed for that commodity. This is because the price received by the household is high enough to compensate the expected transaction costs. On the other hand, if the market price is less than the decision price, the household would not participate in the market and no output would be sold to the market.

When these additional transaction costs from NTBs are incorporated in the supply function for the selling and buying household in equation 18 and 19, the new supply equations become:

$$q_i^s = q^s \left(P_m - t_v^s - t_f^s - R_t^s ; h_q \right) \text{ for a sellers (22)}$$

$$q_i^b = q^b \left(P_m + t_v^b + t_f^b + R_t^b ; h_q \right) \text{ for buyers.....(23)}$$

According to Jagwe (2011) and Bwalya *et al.* (2013) for the empirical analysis focusing on the selling households as is the case in this study, a linear expression which is assumed for the supply function above (21) is expressed as:

$$q \left(P_m ; h_q h_u \right) = \beta_i P_m + \beta_i h_u - t_i^s - R_t^s \text{ (24)}$$

Whereby $t_i^s = -\beta_i^s h_q^s$ for sellers

This leads to a linear expression of the supply function of the household as a seller:

$$q^s = \beta_m P_m + \beta_i^s h_i^s + \beta_q h_q + R_t^s \text{ (25)}$$

Then, the econometric specification is obtained by adding an error on the supply equation (25) of a household as a seller and it is expressed as:

$$q^s = \beta_m P_m + \beta_t^s h_t^s + \beta_q h_q + R_t^s + \varepsilon_i \dots\dots\dots (26)$$

Therefore, the probability of household to participate in the market and supply good ith will be specified as:

$$\Pr(S^s = 1) = \Pr(P^m + h_t \beta + h_q \beta + R_t > \varepsilon_s) \dots\dots\dots (27)$$

Thus, equation (27) in the reduced form (latent) can be expressed as:

$$\Pr(S^* = 1) = \beta_s X_s + \varepsilon_s \dots\dots\dots (28)$$

Where; X_s = factors affecting the likelihood of household to participate in the maize market
 β_s = coefficients to be determined in the model

The above model (equation 28) is based on a dichotomous selection mechanism; therefore it would then follow the Heckman's two-stage approach in estimating the effects of NTBs on market participation.

3.2.2 Model specification for market participation

To analyse the households' decisions on market participation, the study used the Heckman's two-stage procedures in estimating the effects of NTBs on market participation. This is because the Heckman model has the ability of taking care of the zero values from the binary variables (Bwalya *et al.*, 2013) and it allows for the separation between the initial decision to participate ($y > 0$ vs $y = 0$) and the decision of how much to participate in terms of the quantity sold (y) (Blaylock and Blisard, 1993; Markhura *et al.*, 2001). This model is contrary to Tobit model that assumes that the same set of parameters and variables can

determine both the probability of market participation and the extent of participation (Blaylock and Blisard, 1993). In addition, the Heckman's model (1979) has the ability of handling the anticipated problem of selection bias in the sample. Selection bias was anticipated in the data because only those who managed to supply maize to the market were considered (Bwalya *et al.*, 2013). The two-stage Heckman model used the Probit model in the first stage in estimating the effects of NTBs costs on farmers' decision to participate or not to participate in the market. The Probit equation for the estimation of the probability of market participation of households as sellers (S_i) was expressed as:

$$\Pr[S_i = 1 | X_i, \beta] = \Phi[(X_i, \beta)h_u] + \varepsilon_i \dots\dots\dots (29)$$

Whereby S_i = is an indicator variable presenting quantity of maize sold by the household

Φ = is the standard normal cumulative distribution function,

X_i = is a vector of factors affecting market participation decision by households,

β = is a vector of coefficients to be estimated from the model,

ε = is the error term assumed to be normally distributed with a mean of zero and a variance σ^2 .

However, to capture the unobservable decision from farmers, the latent variable Y^* was established which measures the utility outcome that a farmer i gets from participating or not participating in the market. The variable Y^* takes the value of 1 if the marginal utility that the household gets from market participation is greater than zero and 0 if otherwise. Then, unobservable underlying utility function which ranks the preference of the i^{th} household can be expressed as the market participation equation in a linear Probit model as:

$$Y^* = \beta_i X_i + V_i \dots\dots\dots (30)$$

Whereby: Y^* is the latent variable of utility that the i^{th} household gets from participating in the maize market and error term assumed $V \sim (N, 1)$, so we have the following expression;

$$S_i = 1 \text{ if } Y^* > 0 \dots\dots\dots (31)$$

$$S_i = 0 \text{ if } Y^* \leq 0 \dots\dots\dots (32)$$

In the second stage of Heckman model, the Ordinary Least Square regression (OLS) technique was used in estimating the extent (intensity) of market participation by the household in the form of quantity of maize sold. Then, the OLS regression was expressed as:

$$S_i = X_i \beta_i + \varepsilon_i \dots\dots\dots (33)$$

Whereby X_i = represents vector of explanatory variables such as household characteristics, location characteristics and NTBs that influences the intensity of the market participation by household.

β = is a vector of coefficients to be estimated from the model and ε is the error term.

However, if S_i has to be regressed on X using the observed S 's only, when we run using OLS the regression equation (33) will yield biased results (estimates). This is because the error terms for the Probit model and regression models are correlated with $\text{cov}(\mu, \varepsilon) = \rho$. To correct this potential selectivity bias in the sample, the Inverse Mills' Ratio (λ), which was calculated from the first stage of Probit was introduced on the OLS regression equation as an explanatory variable (Gujarat, 2004). The significance of coefficient of IMR will indicate

that the selection model must be used to avoid selectivity bias. Thus, the regression equation becomes:

$$E[Y_i / S_i \gamma > 0] = X_i \beta_i + \rho \sigma_{\varepsilon_i} \lambda_i \dots\dots\dots (34)$$

Whereby; X_i = represents a vector of explanatory variables determining market intensity after correction for selection bias.

β = is a vector of coefficients, σ_{ε} and σ_{μ} are standard errors for the random terms for the regression and selection models respectively.

λ = represents the inverse Mills' ratio, given as (Siziba *et al.*, 2010):

$$\lambda_i = \frac{\theta\left(\frac{S_i \gamma}{\sigma_{\mu}}\right)}{\Phi\left(\frac{S_i \gamma}{\sigma_{\mu}}\right)} \dots\dots\dots (35)$$

Whereby; Φ and θ represent the standard normal cumulative distribution function and standard normal distribution function respectively.

Table 2 presents variables that influence households' market participation decisions and their hypothesized signs for both Probit and OLS regression models.

Table 2: Explanation of variables and the hypothesized relation with market decisions by farmers as used in the Probit and OLS models

Explanatory variable	Definition of variable	Unit of measurement	Hypothesized sign
Price	Market price of maize at farm gate level	TZS	Positive (+)
Harvest	Total amount of maize harvested by ith household in a given year	Kg	Positive (+)
Distance	Distance from household home to district markets	kilometers	Negative (-)
Age	Age of the household head	Number of years	Positive (+)
Sex	Sex of ith head of household	Male =1 female = 0	Positive (+)
Education	The number of year in schooling of the ith head of household	Number of years in schooling	Positive (+)
Household size	Total number of households members of the ith household	Number of adults and children that belong to the household	Positive (+)
Area	Area located for maize production	Acres	Positive (+)
Livestock	Number of livestock owned by the household	Number of livestock	Positive (+)
Motor bike	If the ith household own motor bike	Yes = 1 No= 0	Positive (+)
Ownership of ox-cart	If the household own ox-cart and used as mean of transport	Yes = 1 No= 0	Positive (+)
Market experience	Market experience of the head of household	Number of year in maize marketing	Positive (+)
NTBs equivalent	Cost of NTBs incurred by household and trader in transporting maize to markets	TZS	Negative (-)

To estimate the probability (P_i) of farmers' decision on whether or not to participate in the markets, the Probit regression equation (29) was expanded to include all variables related to market and households characteristics and the regression equation in the linear form was stated as:

$$Pr(S=1) = \text{Ln}\left(\frac{P_i}{1-P_i}\right) = S_i = \beta + \beta_1 P^m + \beta_2 QSH_i + \beta_3 HDM_i + \beta_4 HHB_i + \beta_5 HMB_i + \beta_6 VLK + \beta_7 AGE + \beta_8 EDU + \beta_9 HHS_i + \beta_{10} EXP + \beta_{11} SEX + \beta_{12} R_i + \beta_{13} HA_i + \varepsilon_i$$

..... (36)

In the second step of the Heckman model, the OLS in linear natural log was used to estimate the effects of NTBs on the quantity of maize sold by households whereby only those who participated in selling maize were included in the model and the equation was expressed as:

$$S^s = \alpha + \beta_1 QSH_i + \beta_2 HDM_i + \beta_3 HMB_i + \beta_4 HCP_i + \beta_5 VLK_i + \beta_6 AGE_i + \beta_7 EDU_i + \beta_8 HHS_i + \beta_9 EXP_i + \beta_{10} SEX_i + \beta_{11} R_i + \beta_{12} HA_i + \beta_{13} P_i + \lambda_i + \varepsilon_i$$

..... (37)

3.2.3 Estimation of NTBs costs as incurred by farmers and traders in the study area

Since, the costs of NTBs were directly incurred by traders because of being accessible and involved in trade at the market and indirectly incurred by farmers through lowering farm-gate prices; the estimation of NTBs costs at the farm level was based on the costs incurred by traders at the markets. In the quantification of the NTBs cost, the standardized comparable unit method (Table 1) was used whereby comparable units such as the money paid by traders or farmers to overcome NTBs obstacles were estimated. To obtain the total value of NTBs costs, the study added all the costs incurred by traders or farmers in terms of money and time wasted at various NTBs. Moreover, the amounts of money paid by traders or farmers for accommodation and meals in a day were used as proxy for time wasted at the weighbridges, road blocks, and custom points. It was further assumed that farmers through traders would have to incur a constant amount of money at different NTBs and this value was multiplied by the number of such NTBs to obtain the total value incurred by farmers or traders at such kinds of NTBs, which in this study included road blocks, weighbridges, police check points, custom procedures, and council permits. Therefore, the total value of NTBs costs was the sum of all the costs in monetary terms including the money paid for

accommodation and meals (T_{ij}). The following formula was used to estimate the mean value of NTBs for a farmer or trader.

$$R_{ij} = \frac{1}{N} \sum_{j=1}^j T_{ij} \dots\dots\dots (38)$$

Where: R_{ij} = the mean cost of NTBs in monetary form paid by i^{th} farmer or trader on clearing NTB obstacle j for $j=1 \dots 5$,

Where: j_1 = Road blocks,

j_2 = Weighbridges,

j_3 = Police check points,

j_4 = Custom procedures points and

j_5 = Council permits.

T = Total costs of NTBs in TZS per ton incurred by farmer or trader on clearing NTBs j .

N = Total number of all NTBs strategies imposed and crossed by farmer or trader to reach markets in the study area.

3.2.4 Derivation of supply function using duality model

According to the theory of Agricultural Households (AHM), smallholder farmers in Developing Countries (LDCs) especially in the rural areas exhibit a dual role as producers and consumers of their own produces. In this respect, the producing households exhibit a dual character of being producers and consumers at the same time (Key *et al.*, 2000; Onono *et al.*, 2013). However, in order to capture the dual behaviour of a household of being both a producer and a consumer, the duality model was employed in analysing the effects of NTBs on maize production and marketing. This is because under the dual (or reduced form) model, the profit function can be used to describe the production technology set indirectly (Wall and Fisher, 1988). Under this approach, the profit function can either be estimated

from cross-sectional data or from time series data that show variation in prices and fixed factors (McFadden, 1978; Sadoulet and de Janvry, 1995).

Moreover, under the duality model, output supply and input demand functions can easily be indirectly derived from the profit function which satisfies the properties of convexity and monotonicity (Wall and Fisher, 1988). Then, the derived output supply and input demand functions can be treated as they come from the origin production function. Thus, the optimum level of outputs and factors which yields maximum profit function was expressed as:

$$\pi = \pi(P, R; Z) \dots \dots \dots (39)$$

$$s.t. F(P, R; Z) \leq 0. \dots \dots \dots (40)$$

Whereby: $P = P_1, \dots, P_{m+1}$ = vector of output prices

$R = R_{m+1}, \dots, R_n$ = Vector of variable inputs prices

Z = represents the quantities of quasi- fixed factors of production which include the area planted with maize, the total cultivated Area (acre), and the distance (km) to the district markets. This profit function depicts the maximum profit the farmer could obtain at a given price, availability of fixed factors and the production technology.

Using Hotelling's Lemma property, the output supply and input demand equations were derived by differentiating the profit function with respect to the prices given that the function satisfying convexity and monotonic conditions (Key *et al.*, 2000; Ihle *et al.*, 2009). Then, the derived output supply and input demand equations can be expressed as:

$$Y_m(P, R; Z) = \partial \pi(P, R; Z) / \partial P_m, \forall m = 1, \dots, m, \dots \dots \dots (41)$$

And

$$-X_n(P, R; Z) = \partial \pi(P, R; Z) / \partial R_n, \forall n = m+1, \dots, n \dots \dots \dots (42)$$

Whereby: m and n index the outputs and variable inputs respectively.

Since, the profit function was assumed to be continuous in both output and variable inputs prices (Wall and Fisher, 1988; Key *et al.*, 2000), the two derived supply and input demand functions from equation (41) and (42) in the reduced form can be expressed in linear relations form as:

$$Y_m = f(P, R; Z) \dots \dots \dots (43)$$

$$-X_n = f(P, R; Z) \dots \dots \dots (44)$$

Then, supply function is positive and demand function is none-positive and will slope downward because the π function is a convex function.

Thus, maize household farmers as key market players in Tanzania were reported as facing many transaction costs including those raised by NTBs costs such as road blocks, custom procedures, council permits, and weighbridges (Mbise *et al.*, 2010; KI, 2011). The transaction costs sourced from NTBs are reported to have eroded a large percentage of the farm gate price which is said to be the motivation for farmers' participation in different market activities. According to Makhura *et al.* (2001), farmers also incur normal transaction costs (both variable and fixed) when they search for a good buyer of their produces out of that inherited from traders as compensation for transaction costs. These costs are considered in the decision prices before a farmer decides on how much to produce and supply the produce to the markets. The inclusion of these costs could even worsen the effective prices received by farmers. Therefore, if these effects are included in the supply function of a

producer, the supply function with transaction costs related to selling of outputs and purchasing of inputs in a linear form can be expressed as:

$$Y_m = f(P^m - t^s, P_I + t^v; Z) \dots\dots\dots (45)$$

Since, the transaction costs (including those attributed by NTBs) incurred by traders in transporting maize from the production point to the urban markets in the actual sense are paid by farmers in the form of high and low prices offered by traders for inputs and outputs, it is therefore imperative to include them in the supply function (45) of a producer as explanatory variable. Thus, the inclusion of NTBs costs (R) would enable the researcher to estimate their effects on the quantity of maize which farmers would be ready to produce and supply to the markets. The new supply function with NTBs inclusion will be expressed as:

$$Y_{mi} = f(P_m - t_v^s - t_f^s - R_t^s, P_I + t_v^b + t_f^b + R_t^b; Z) \dots\dots\dots (46)$$

Whereby:

P_I = the price of inputs as fertilizer and labour

Z = quantities of quasi- fixed factors of production which include total cultivated Area (acre) and distance to district markets (km).

R = NTBs costs (TZS)

To estimate the effects of NTBs on the production of maize by smallholder farmer in the study area, the derived supply function using duality model in logarithm form was used. The equation 46 was expanded in order to include all the factors that influence the supply of maize; and the relationship in the natural logarithm was expressed in the following equation:

$$\ln Y_m = \ln \beta_0 + \beta_1 \ln P^m + \beta_2 \ln P^f + \beta_3 \ln P^v + \beta_4 \ln P^w + \beta_5 F + \beta_6 \ln Z^m + \beta_7 W^c + \beta_8 \ln R^i + \varepsilon \dots\dots\dots (47)$$

Whereby:

Y_m = total quantity of maize produced (kg),

β_0 = constant

P^m = market price of maize (TZS/kg)

P^f = Rate of fertilizer application (TZS/Acre)

P^v = price of improved seeds (TZS/kg)

F = Family size (number of person)

Z^m = total land size allocated to maize (Acre)

P^w = Labour wage rate (TZS/day)

W^c = Weather condition (Good =1 and Poor = 2)

R^i = NTBs equivalent (TZS/kg) and

ε_i = random error term.

3.3 Research Design

The study used cross-sectional research design in the collection of primary data. The cross-sectional design was selected because we wanted to collect data on the costs of various NTBs, production, prices, and the volume of maize sold and stockpiled at one point in time by smallholder farmers and traders in Mbozi and Momba Districts. Also, the design was selected because NTBs costs are subject to change overtime; thus, if it was done otherwise we could not get unified results.

3.4 Sampling Procedures and Sample Size

3.4.1 Sampling frame

The sampling frame (population) involved in this study included all smallholder maize farmers in the selected wards in Mbozi and Momba Districts. On the other hand, the registered local maize traders from the two major district markets (Mlowo and Tunduma) constituted the sample frame for traders who were involved in this study. However, maize was selected in this study because it is the main staple food crop in Tanzania and it is consumed by the majority of the population of about 90 percent of the households in the study area. Therefore, its marketing in the two districts is frequently influenced by government interventions through the application of NTBs.

According to the National Census of 2012, the estimated population size of the two districts were 643 157 people among these Mbozi had about 446 339 people and Momba had 196 818 people (NBS, 2012; 2014). Moreover, the total estimated population size for the four wards which were selected in the two districts was about 61 527 people whereby Igamba ward had about 19 768 people, Ihanda had 16 462, Chiwenzi 14 176 and Nkangamo 11 121 had people (NBS, 2014; Mbozi District Council, 2014).

3.4.2 Sampling procedures

According to Barret (2008) and Karugia et al. (2009), the effect of NTBs on farmers and traders is heterogeneous among smallholder farmers because of their differences in the level of infrastructure and access to productive assets which integrate them into local and international markets. To overcome the problem of heterogeneity, a two-stage stratified sampling procedure was used in the selection of wards and villages which were involved in this study. In this regard, wards in the study area were stratified based on the distance to the district markets the farmer's homestead is and this created homogeneity among the

selected wards. Thus in the first stage, wards from the available list at the districts offices and with the help of the Agricultural officers were stratified into two strata. The first stratum comprised wards that were close to the district markets; Mlowo and Tunduma maize markets for Mbozi and Momba respectively. The second stratum comprised wards which were located far away from the two district markets. Thus, one ward from each stratum was randomly selected in every district making a total of four wards (two wards from each district). In this respect, Ihanda and Chiwenzi wards were selected in the first stratum as they were located closer to their respective district markets (about 5km and 4km from Vwawa and Tuduma for Ihanda and Chiwenzi wards respectively). In the second stratum, Igamba and Nkangamo wards were selected because of being located far from the district markets. The selection of wards was also based on maize production potential and the existence of NTBs which were the target of this study. Wards with no NTBs during the period of study were not included in the study.

In the second stage, eight villages from the selected four wards in Mbozi and Momba Districts were randomly selected using a systematic sampling technique. The selected eight villages included; Igamba, Itepula, Shiwinga, Ihanda and Malonji in Mbozi District and Mpemba, Chiwanda and Isanga in Momba District. The number of villages selected was determined by the proportion of the population size to the total population in the four selected wards from the two districts. The population for Igamba and Ihanda wards in Mbozi District was 36 230 people (60%) and 25 297 people (40%) for Chiwenzi and Nkangamo wards in Momba District. Therefore, using these population distribution, a proportion of 60% villages (about 5 villages) were sampled from Mbozi District and 40% villages (equivalent to 3 villages) were randomly selected from Momba District (Table 3). Thus from each village, the sampled householder farmers were proportionally selected using the Kothari (2009) formula from the total number of households and interviewed

(Table 3). This makes a sample size of 400 smallholder famers in total which were involved in this study.

In addition, using the list of 150 registered local traders for the two maize district markets and with the help of Trade and Marketing District Officers, 50 wholesale maize traders were randomly selected using the systematic sampling technique whereby every 3rd trader was selected after the first one had been selected. From each district market, 25 traders were selected and interviewed using structured and semi-structured questionnaires. To be consistent in gathering information, only registered local traders at Tunduma and Mlowo markets were involved. This is because local traders are the ones who frequently meet and interact with rural famers at their farm and homestead for market exchange.

3.4.3 Determination of sample size

The study used the Yamane (1973) formula to compute the sample size in the study area. The formula assumes a 5% degree of significant level and it was expressed as shown below:

$$n = \frac{N}{1 + N(e)^2} \dots\dots\dots (48)$$

Where:

n = Sample size

N = Population Size in the selected wards

e = The desired level of precision

$$n = \frac{61527}{1 + 61527(0.05)^2} = 397$$

Based on the Yamane formula, the calculated sample size was approximated to 400 be respondents for easily distribution of the households in the sample. Since the targeted respondents for this study were the household heads from the two districts, the total number of households from the two districts was used in determining the number of household

heads to be involved in the sample. Therefore, from the total number of 7 380 households from the selected four wards in the study area, a sample size for each village was proportionally selected using the formula proposed by Kothari (2009). Table 3 shows the established districts; wards, villages, number of households, and the respondents who were included in the sampling size and used in this study.

Table 3: Profile of the study area and respondents involved in the study

Name of District	No. of wards	Name of Village	Village Population	Total no. of Households	Selected Households	Gender of HH head	
						Male	Female
Mbozi	2	Itepula	4 124	722	35	25	10
		Igamba	4 660	1 684	83	60	23
		Shiwinga	3 743	760	37	27	10
		Ihanda	4 710	963	47	34	13
		Malonji	3 863	781	38	28	10
Momba	2	Mpemba	4 742	780	57	42	15
		Chiwanda	3 197	730	53	39	14
		Isanga	3 144	690	50	37	13
Total	4	8	32 183	7 380	400	292	108

3.5 Data Collection Procedures and Instruments

3.5.1 Primary data

In the process of collecting primary data, structured and semi-structured questionnaires were administered by the researcher and trained research assistants to the farm households in the study area. The survey was conducted between June and December 2014 and involved a face-to face interview with smallholder farmers and traders in Mbozi and Momba Districts. The targeted interview respondents were household heads even though in the case where the head of the household was not available, another adult in the household preferably the spouse was interviewed. In this study, 73% of the respondents were male household heads and 27% were female household heads (Table 3). The primary data on production, prices (inputs and outputs), quantity stockpiled and transport costs, storage costs, tariffs and cost NTBs (in TZS) were gathered from the maize producers and traders. In addition to questionnaires, personal observation by the researcher was used for gathering information such as money paid as bribe and other administrative procedures, which was not easy to quantify.

To capture the opinions, attitudes, and perceptions from farmers on NTBs costs, a total of four FGD were organized and facilitated whereby one for each ward in the study area was conducted. The FGDs were made of 6 to 8 participants of whom gender balance was given priority. A list of guided questions (Appendix 4) was used in asking questions and probes the discussion by the researcher as a moderator and one assistant researcher who was taking notes from the discussion. Furthermore in order to facilitate the discussion among participants, the moderator asked questions that probed for more detail where necessary and making sure that the discussion does not deviate from the main topic and that everyone has equal chance and no one person dominates the discussion. The discussions were focused on the costs of NTBs in terms of time spent on seeking clearance to pass the NTBs and the

money paid too, the structure and types of NTBs, and their effects on production and marketing of maize. Thus, the information obtained from these discussions was transcribed into themes through content analysis and used in complementing information collected through questionnaires.

In addition, interviews with Key Informants (KIs) were conducted to transporters, District Officers, Custom Officers and Extension Officers whereby a checklist of open-ended questions was used to guide the interview (Creswell *et al.*, 2007). The guided questions were designed in a manner such that KIs could easily share their experience regarding the effects of NTBs on maize production and marketing. The interview with KIs was conducted on face to face basis with individuals at their convenience time. In addition, the KIs were selected purposively based on their roles and experiences on NTBs, maize production, marketing and transportation. The information collected under this method included the number of NTBs, challenges faced by transporters which are related to NTBs, procedures on securing and, buying export permits, custom procedures and the effects of NTB on maize trade.

3.5.2 Secondary data

Secondary data on production, producer, and wholesale prices of maize were collected from various sources including Ministry of Industries, Trade and Investment (MITI), Ministry of Agriculture, National Bureau of Statistics (NBS) and respective Region and districts offices. At the MITI, the researcher collected only wholesaler and retail prices but the producer prices were scarce and available only for few months or years. This situation forced the study to rely on the cross-sectional data which were collected from the field. Thus, the little collected secondary information was used in filling the missing prices in some monthly data in the study area.

3.6 Data Processing and Analysis

The collected data through questionnaires were firstly coded, cleaned, and entered into statistical computer software and analysed using STATA statistical package version 11. Also, this statistical package (STATA) was used in fitting the regression models (such as Probit and Regression model) which were used in this study. The STATA was selected because it relatively gives more alternatives of computation for different econometric models as compared to other software such as SPSS. Thus, the first step of the data analysis was to identify demographic characteristics for each farmer and trader in the selected villages and markets. The descriptive statistics features which were used to summarize the information from demographic characteristics included the frequencies, percentages, means, and standard deviation. The results were then presented in tables, histogram, graphs, and pie charts from which inferences were drawn. Furthermore, modes of transport and major selling places for farmers and traders were also identified and compared between farmers and traders from the two districts.

On the other hand, the information collected from FGD and observation were analysed using content analysis whereby respondents' views on the effects of NTBs were categorized into different themes and matched with the empirical literatures and theories to give meaningful contextual statements. Then, the constructed statements were used to supplement the findings from the questionnaires. The following section explains in detail the analysis carried out to achieve the specific objectives of the study.

3.6.1 Contribution of NTBs on transaction costs

With regards to objective one, the percentage contribution of various types of NTBs on price and total transaction costs incurred by farmers and traders were measured as

percentage of the total marketing costs. However, to estimate their contributions to the transaction costs incurred by farmers, the cost of an individual NTB was calculated as the percentage to the total costs of NTBs incurred by farmers and traders in the study area. The following equation was used in determining the percentage contribution of individual NTB:

$$PSC_i = \frac{CNTBs_i}{TCNTB} * 100 \dots\dots\dots (49)$$

Where;

PSC = Percentage share contribution of individual NTB such as road blocks, police check point or weighbridge.

TCNTBs = Total costs of all NTBs incurred by the farmer and trader to reach markets

CNTB = Costs of individual NTB as experienced by farmers and traders

3.6.2 Effects of NTBs on prices received by smallholder farmers

The estimation of the effect of NTBs on price received by farmers in the two districts was done in two stages. In the first stage, the Ordinary Least Square regression (OLS) technique was conducted to estimate the effects of NTBs on prices. To capture the spatial effects of NTBs, the distance from the selected villages to Tunduma maize market was used as a reference point. This is because most of the maize from the two districts are sold and across the borders to the neighbouring countries (Zambia, DRC and Malawi) through this market. In the second stage, the independent T-test was used in comparing the differences in the effects of NTBs between the two districts.

3.6.2.1 The ordinary least square regression (OLS)

The multiple regressions model showing the relationship between dependent (farm gate price) and independent variables at the first stage was presented under the following equation:

$$\ln P_t = \beta_0 + \beta_1 \ln P_i + \beta_2 \ln IP_t + \gamma \ln Db_t + \rho \ln R_t + \eta \ln S_t + \varepsilon_t \dots\dots\dots (50)$$

Whereby;

P_t = Maize price at the farm gate level (TZS/kg)

P_i = Market price of maize at the urban market (TZS/Kg)

IP = represent international prices at period t (TZS/kg)

S = is the seasonal dummy variable measuring the effects of season variation on the local prices (Harvest season =1, lean season= 0).

Db_t = is the variable that measures the distance between rural market and border markets at Tunduma,

R_t = NTBs costs as attributed by road blocks, weighbridges, council permit and custom procedures (TZS/kg).

ε = Error term

β , γ , η and ρ = coefficients parameters to be estimated from the model.

However, the coefficient ρ in equation (50) will measure the effects of NTBs imposed on average price level between two markets in Mbozi and Momba districts.

However, the dependent and independent variables entered in the OLS model are as described below.

i) Dependent variable (*famgprice*)

The farm gate price received by farmers was used in the estimation of the extent and direction on the change in NTBs strategies as imposed by the government in terms of road blocks, police check points, and weighbridges. The farm gate price was computed in TZS per kilogram of maize in a given village. For farmers to decide whether or not to put more resources in the production of maize was highly dependent on the effective prices (shadow) offered by traders in the market. Therefore, understanding of the effects and direction of

NTBs on the price could give an indication of the amount of maize produced and supplied to the markets by farmers.

ii) Independent variables

NTBs equivalent (R)

The NTB equivalent (R) was estimated in the first point using equation (37) as described in the previous section (3.2.3).

Price at the urban markets (P^u)

The selling price at the urban markets of Tunduma, Vwawa and Mlowo was also used in the analysis because the farm gate prices at the rural markets are linked to the prices in the urban markets. Therefore, for a producer to increase production and supply more outputs to the market would depend on the level of the prevailing price in the urban markets. It was observed also that, large volumes of maize from producer in the two districts were sold to these markets. This situation necessitates the study to include local prices in the urban markets in the analysis.

Distance (Db)

This is the continuous variable that measures the distance between rural market in Mbozi and Momba District and in the border markets in Tunduma. The distance from the rural markets to urban centre was measured in kilometers. The distance was used to measure the spatial effect of NTBs on the prices received by farmers when transporting maize to Tunduma market. This was based on the observation that farmers who live close to the markets experienced low market transaction attributed to NTBs than those who live far from the urban markets (Makhura *et al.*, 2001; Bwalya *et al.*, 2013).

Maize international price (IP)

The international price measured in Tanzania shilling per kilogram was included in the model because maize in the two districts was also traded across borders to Zambia, Malawi and DRC. Therefore, international price was considered to have some influence on the domestic maize prices which were received by farmers and traders. The international price was valued at f.o.b basis taken for the period ranging from 2008 to 2014 as average value.

Seasonality (S)

This is the seasonal dummy variable measuring the effects of season variation on the local maize prices given as harvest season =1, lean season= 0. The effects of seasonality will also represent the change in the quantity of maize harvested by farmers in the two districts.

3.6.3.2 Comparison on the effect of NTBs on maize price between Mbozi and Momba districts

In the second stage of the estimation of NTBs on farmers' price, an independent sample t-test was conducted to compare the mean difference of NTBs effects on maize price among farmers between the two districts. This is because independent t-test is an appropriate tool for comparing two groups with different sample means but equal variances (Saunders *et al.*, 2007; Kothari, 2009). In order to test the significant of association, it was assumed that, when the value of probability of associations for tested groups was found to be less than 0.05 then the relationship was said to be significant and if the probability was found to be greater than 0.05 then the relationship was said to be insignificant.

3.6.3.3 Estimation of the magnitude of size effects for NTBs on prices between the two districts

In addition to the t-test, the Eta Squared was used in estimating the magnitude (size) of the mean different effects of NTBs for the two districts. The Eta Squared is a good measure for effect size of mean difference within the context of group differences in the given

observation (Cohen, 1988). The Eta Squared was calculated using the following formula as proposed by Cohen (1988).

$$EtaSquare = \frac{t^2}{t^2 + (N_1 + N_2 - 2)} \dots\dots\dots (51)$$

Whereby: t = calculated T- statistics

N_1 and N_2 = presents number of sample size of farmers in Mbozi (240) and Momba (160) districts.

Eta squared is the statistical measures of the size of the effects of dependent variable which can range from 0 to 1 and represents the proportion of variance in the dependent variable that is explained by the independent (group) variable. According to Cohen (1988), the value of Eta Squared above 0.09 is interpreted to show a larger effect, 0.06 moderate effects, and 0.01 small effects.

3.6.4 Effects of NTBs on supply and marketing of maize in the two districts

The supply function as presented in equation 47 in section 3.2.4 was used to estimate the effects of NTBs on the production of maize from smallholder farmers in the study area. The equation used is expressed as:

$$\ln Y_m = \ln \beta_0 + \beta_1 \ln P^m + \beta_2 \ln P^f + \beta_3 \ln P^v + \beta_4 \ln P^w + \beta_5 \ln Z^m + \beta_6 \ln R^i + \varepsilon \dots\dots\dots (52)$$

3.7 Limitations of the Study Methodology

The study methodology faced several challenges related to accessing the NTBs information such as costs of NTBs paid as bribe from police check and custom points. It was difficult to obtain data from this kind of situation. To overcome the problem of limited information on bribes, the researcher consulted those who paid bribes to policemen at the road blocks such as traders, transporter and farmers to obtain information. It was also found that,

farmers were not well informed about some of the NTBs in their locality. To some extent this caused some difficulties in complementing the findings obtained from the traders who were found to be more informed on the NTBs costs. However, to overcome this challenge, information from key informants was used to supplement information from traders. On the other hand, unavailability of enough secondary data from the Ministry of Industry, Trade and Investment forced the study to rely on primary data in analysing the effects of NTBs on maize prices both in short and long term periods. The problem of shortage of secondary data was solved through employing different analytical models which fit for primary data in estimating the effects of NTBs on production and marketing. These models include regression, duality, and Probit models.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Respondents

4.1.1 Households demographic characteristics

Table 4 presents the demographic characteristics of the respondents from Mbozi and Momba Districts. Results on sex of the household heads indicate that majority (73%) of maize famers from the two districts were males while only 27% of them were females. This implies that most of the households were headed by males who were the main decision makers at the household on issues regarding to production and marketing.

Marital status was one of the variables which were captured in this study, results from Table 4 indicate that about 86% of the respondents in the two districts were married, only few (4.14 %) of them were single while about 9.6% were widowed. However, in respect to district, the percentage of married household was more less the same for the two districts, but there was more widowed and singled respondents in Momba District than was the case in Mbozi District. Generally, the percentage of widowed respondents was higher in the two districts (9.6%) compared to other districts in the region for instance Ileje had only 6.43% (NBS, 2012). This can be attributed to the prevalence of high level of HIV AIDS cases in the two districts. These findings concur with those of Aloyce *et al.* (2014) and (NBS, 2012) who found that there was higher percentage of widowed households (13%) in Mbozi District than was the case in other districts (Mvomero, Sumbawanga and Bariadi) due to the prevalence of HIV/AIDS.

Table 4: Demographic characteristics of maize household in the study area

Demographic characteristics of HH		Districts		
		Mbozi (%) (n =240)	Momba (%) (n=160)	Total (%) (N=400)
Gender of HH head	Male	69.3	77.8	72.5
	Female	30.7	22.2	27.5
Marital status of HH head	Married	86.7	85.6	86.26
	Single	1.3	8.9	4.14
	Widowed	12.0	5.6	9.6
Education level of HH head	None	1.3	0.0	0.8
	Primary	88.0	85.0	85.6
	Form four	8.1	13.3	12
	High school	1.3	1.1	0.8
	College/University	1.3	0.6	0.8

Moreover, findings on education level for household heads indicated that a larger percentage (86%) of farmers had primary education while only few had attained secondary and college education in the two districts (13% and 0.8% respectively). This implies that most of the household heads had only attained the lowest level of education (primary in this regard), the situation which could be linked to the inability of such farmers to access market information and tap the available opportunities for their maize produce. These findings concur with those reported by Lubungu *et al.* (2012) who revealed that households with higher level of education may have higher abilities of negotiation and therefore have more information than those with relative less education. The low level of education has also been implied in their places of sales of the maize for majority (81%) of farmers being at home in the two districts.

Furthermore, Table 5 presents means of age, family size, experience and distance to the urban markets for farm households in the study area. The average age among maize farmers

in the two districts was 44 years and the minimum age was 24 years. This indicated that, maize production in the two districts was predominantly carried out by youth and adults and older households were retired from the maize production activities. In addition, the mean number of years that a household had spent in maize farming and marketing was about 21 years. This indicates that most of the farmers had enough experience in farming practices and knowledge which could enable them to produce maize and access markets if there was no government intervention in the market. In addition, the average number of household members among smallholder farmers was 7 persons per household. However, the family size of 7 persons was higher than what was reported in the National Population Census of 2012 of 5 persons per household (NBS, 2014). The large number of persons in the family implies that, more maize is needed for consumption but on the other hand it indicates higher ability of the household to produce more maize using family labour only. The findings also indicate that the mean distance to the district markets in the two districts was 15 km which implies that majority of farmers were located far from the district markets. Being far from the district markets implies an increase in transaction costs and limited access to the market among farmers in the two districts.

Table 5: Socio - demographic characteristics of maize farmers in the study area

Variable	Mean	Std. Deviation	Minimum	Maximum
Age (Year)	43.62	10.022	24	72
Family size (No. of person)	6.64	2.605	3	16
Years of experience in farming (Year)	20.92	8.69	2	47
Distance to district market (Km)	14.77	10.69	5	40

4.1.2 Methods of transportation used by smallholder farmers and traders

Modes of transport used by maize farmers and traders in Mbozi and Momba Districts are presented in Table 6. The common major means of transport used in Mbozi and Momba Districts varies among smallholder farmers and traders. The results from Table 6 show that traders used vehicles such as pick up, lorries and long trucks (30 – 40 tons) more in transporting their maize from the point of production to the markets than was the case with farmers. However, long trucks of 40 tons (Semi trailers) were commonly used when a trader wants to sell his/her maize to the major consumer markets such as Dar es Salaam, Moshi, Tanga, and Mombasa (Table 6). Smaller trucks such as pick up and 7 ton lorry (*Fuso*) were mostly used in transporting maize from the villages to the district markets such as Tunduma, Vwawa, and Mlowo in Momba and Mbozi Districts respectively. However, about 68% of the interviewed traders in the two districts used Semi-trailers, while 24 percent used 7 tons lorry (*Fuso*) and only 8 percent used pick up in transporting maize produce to the markets. These findings were consistent with those reported by Karugia *et al.* (2009) and KI (2011) who found that about 70% and 52% of maize traders in Tanzania and Kenya respectively were using lorries in transporting maize to their targeted markets.

Table 6: Means of transport used by maize traders and famers in Mbozi and Momba districts

Modes of Transport	Traders (N = 50)		Farmers (N = 400)	
	Frequency	Percent	Frequency	Percent
Semi-trailers (40 tons lorry)	34	68	-	-
7 ton lorry (Fusso)	12	24	-	-
Car (Pick Up)	4	8	-	-
Ox-cart	-	-	100	25.0
Motorcycle/bike	-	-	168	41.7
Walking (on foot)	-	-	132	33.3

On the other hand, the means of transport such as bicycles, motorcycle, and ox-carts were found to be commonly used by farmers in transporting maize to the village and to the nearby urban centre markets. However, most of the farmers were found using bicycles and motorbike in transporting their maize to the nearest villages or to the local markets. On the other hand, about 33% of the interviewed farmers reported to have been walking to the market from the village and about 25% of them used ox-cart. This implies that majority of the farmers in the two districts (Mbozi and Momba) could not manage to sell their maize to the district markets (at Tuduma and Mlowo) which were located far from their home places. Lack of good means of transport and poor rural roads forced farmers to sell their maize at the farm gate prices to the middlemen or to other farmers to avoid high transportation costs. This situation was also revealed by having large percentage (81%) of smallholder farmers who reported to sell maize at home (Table 7). These findings are consistent with the findings reported by other scholars (e.g. Haug and Hella, 2013; Anderson *et al.*, 2013) who found that about 98% and 65% of Tanzanian farmers do sell their produce at the farm gate in Songea and Songwe regions respectively. These findings is consistent with the observation that in most of the LDCs marketing of food crops is dominated by traders whereby farmers' market participation is limited due to having less information about market prices and the demand (Mbise *et al.*, 2010; Bwalya *et al.*, 2013).

4.1.3 Main maize selling places for smallholder farmers in the study area

Results in Table 7 indicate that majority (81%) of rural farm households in Mbozi and Momba Districts sell their maize at home through middlemen who come at their homesteads. About 13% of them sell their maize in the village markets and only 7 percent manage to access in the district markets at Tunduma and Mlowo or Vwawa in Momba and Mbozi Districts respectively. This implies that, accessibility of smallholder farmers to the district (Mlowo and Tunduma) and other major consumer markets such as Dar es Salaam

and Arusha was limited as compared to their counterpart traders. However, the percentage of smallholder farmers who managed to access the district markets in Momba District was higher (7%) as compared to the percentage of smallholder farmers who managed to access the district markets in Mbozi District (5%) (Table 7). This could be attributed to the existence of high transaction costs and market costs in Mbozi resulting from poor rural road networks and NTBs costs. These findings are consistent with the findings reported in of KI (2011) and Haug and Hella (2013) in Tanzania who found that numerous road blocks and weighbridges hamper staple crops from being transported from one place to another within the country. These findings are in line with the theory of transaction cost which stipulates that the existence of transaction costs inhibit farmers from reaching better markets in their locality.

Table 7: Main maize selling places for smallholder farmers in Mbozi and Momba districts

Place of sales	Name of district		
	Mbozi (n = 240) (%)	Momba (n =160) (%)	Total (N= 400) (%)
Home stead	83.3	77.0	80.8
Village market	14.0	16.0	12.5
Town market	5.0	6.0	6.7

On the other hand, farmers thought it was profitable for them to sell their maize at home rather than transporting them to the district markets which they believe it makes them incur a lot of transaction costs including those of NTBs.

4.1.4 Socio-economic characteristics of maize traders in the study area

Table 8 presents mean of age, buying price, selling price, the quantity of maize stockpiled and the duration of storage of maize taken by traders in the study area. The average age

among maize traders in the two districts was 43 years with the minimum age being 30 years. This shows that maize trade in the two districts was conducted by adult traders. Furthermore, the average period taken by the speculative traders in storing their maize was six months. This indicates that most of the traders were not assured of their future market prices due to ad hoc imposition of NTBs which increased more uncertainty to speculative traders. On the other hand, the selling price for traders in the two district markets was at the average of TZS 410 per kilogram. This price is relatively higher compared to what they offer to farmers as a buying price of TZS 250 per kilogram in the two districts.

Table 8: Socio-economic characteristics of maize traders in the study Area

Variable	Mean	Std. Deviation	Minimum	Maximum
Age (Year)	43.46	6.95	30	56
Selling price (TZS/ kg)	410.00	2.00	400	420
Buying price (TZS/Kg)	300.00	4.00	250	350
Amount of maize stored (Kg)	1352.00	784.34	200	3000
Duration of storage of maize (Moths)	6.16	0.61	5	7

4.1.5 Types of NTBs as experienced by traders in the two districts

Results in Table 9 indicate that the number of weighbridges and road blocks which maize traders were subjected to in the two districts differs depending on the distance from the buying point to the major consumer markets in the country (such as Dar es Salaam, Dodoma, Arusha and Moshi). For example, maize traders in Momba and Mbozi Districts passed through 8 and 6 weighbridges from Tunduma to Dar es Salaam market route respectively (Table 9). In addition to weighbridges, traders or farmers in Momba District also had to pass through five major road blocks within Songwe and Mbeya regions from the buying centre to the main consumer markets (Dar es Salaam). In contrast, only three major

road blocks were experienced by traders in Mbozi District to reach the wholesale markets in Dar es Salaam (i.e. Igamba, Mlowo and Igawa).

These findings are in line with the findings reported in a study by Karugia *et al.* (2009) and the World Bank (2012) which reveal that in Tanzania and Kenya the number of road blocks ranges from 4 to 10 and were located along the way from farms to the secondary wholesale markets. Therefore, a trader in Momba District has to pass through Laela, Nkangamo, Tunduma, Mpemba and Igawa road blocks just to cross the two nearby regions of Songwe and Mbeya in order to reach the main consumer market in Dar es Salaam. However, the Igawa road block, which is located at the border of Mbeya (Mbarali district) and Njombe regions, was reported by traders as being very problematic. This is because along this road block, traders were required to pay levy and bribe even if they had already paid in their respective districts. Igawa road block was initially established in 2013 for handling forest products and not staple crops, but now traders pay about TZS 5 000 to TZS 10 000 to district and police officers as a bribe per trip in order to reduce the time wastage at the NTBs obstacle.

Table 9: Number of weighbridges and road blocks crossed by maize traders to the main consumer markets (Dar es Salaam)

From	To	Weighbridges	Road blocks
Tunduma market (Momba district)	Dar es Salaam	8	5
Mlowo market (Mbozi)	Dar es Salaam	6	3

In addition, police check points were found to exist at a distance of nearly every 10 kilometers along the main roads from Songwe region to the main consumer markets such as Dar es Salaam and Moshi. Traders and transporters reported the presence of many police

check-points and road blocks as time consuming and that some of these points were manned by unfriendly police officers. To minimize time wastage at these police check-points, transporters and traders would bribe the policemen and women in order to be easily allowed through these barriers. These findings are in line with those of the World Bank (2012) and FAO (2013) that revealed that police and custom checkpoints as the major source of bribes in Tanzania.

These findings are in line with that the findings in a study by of KI (2011) and Haug and Hella (2013) who revealed that maize traders in Rukwa and Songwe were paying bribes at police check points and road blocks. Traders and farmers in the two districts spent over one hour at these points, which was more than the time reported by Karugia *et al.* (2009) in Tanzania, which indicates that maize traders spent less than one hour per trip at police and custom check-points due to long queues resulting from inadequate staffing and failure by customs officials to comply with rules and regulations related to the trade. This implies that NTBs are still considered as a major tool of enforcing the implementation of food security and price policies in Tanzania.

4.1.6 Estimation of NTBs costs for smallholder farmers in Mbozi and Momba districts

The estimation of NTBs costs in this study has involved the summation of all costs incurred by farmers or traders from the farm to the district market at Tunduma town centre. The Tunduma maize market was used as a reference market in this study because of being the major market for maize from the two districts. In this respect, the total value of NTBs cost was the sum of all the costs in monetary terms and the time wasted due to long queues and waiting at the road blocks, weighbridges, and custom checkpoints in the proximal terms of meals and accommodation paid for by traders per day. The total cost was then divided by

the number of kilograms transported per trip to get the amount of shillings per kilogram (Tshs/kg).

The results as presented in Table 10 indicate that farmers in the two districts experienced similar types of NTBs costs when accessing maize markets in Tunduma market. However, among the cost incurred by farmers in getting through NTBs obstacles include cash payments at the weighbridges, police check points, custom and road blocks in both two districts. This is because weighbridges, police check points; customs, and road blocks were reported to be time consuming and in some cases were staffed by unfriendly police officers or council officers. Therefore, in order for a trader or transporter to reduce the time wastage, farmers had to bribe the police and custom officials so as to pass through the barriers easily (Coulson, 2010; Haug and Hella, 2013).

However, in Tanzania weighbridges are used both for road quality control and as a tool for tax collection in most of the local councils and also in ensuring food supply in the country for future food security purposes (Gabagambi, 2013; FAO, 2015). Therefore, in most cases it has been customary to find local government officials collecting levy or cess at the weighbridge or road blocks. Moreover, the inefficiency of some weighbridges caused congestion of trucks leading to long queues experienced by traders and transporters which amount to wastage of more time in getting the clearance to move across the bridge. Therefore, in order for a trader or transporter to reduce the time wastage at the bridge, she/he had to bribe the officials. It is within this context that weighbridges in LDCs are also regarded as NTBs which is different from the developed countries where markets are more efficient with less information asymmetric.

Table 10: Estimated costs of various NTBs as experienced by maize farmers in Mbozi and Momba districts (TZS/Kg)

District	From	To	Distance (Km)	Road block	Weighbridge	Custom	Police	Permit	Total
Mbozi	Itepula village	Tunduma	60	10.38	26.30	12.71	18.56	5.00	72.90
Momba	Isanga village	Tunduma	40	6.95	17.60	8.52	12.44	3.35	48.84

These findings are in line with the findings reported by Karugia *et al.* (2009) and KI (2011) who found that money paid by maize traders and transporters as bribes was much higher at the weighbridges and police checkpoints in Tanzania and Kenya. According to Karugia *et al.* (2009), the percentages of money paid by traders and transporters at the weighbridges in Tanzania and Kenya were estimated at 0.97 and 2.4 percent respectively. These results imply further that the increased transaction costs resulting from NTBs would make farmers especially in the rural areas continue to be price takers and getting the lowest prices from traders. This is because most of the smallholder farmers in rural areas in a country like Tanzania are said to be price takers and therefore they have to compensate traders from the already incurred market transaction costs in their market exchange (KI, 2011; FAO, 2013; Minot, 2014). Similarly, the findings from this study are in line with those in a study by Magrinia *et al.* (2014) in Africa who revealed that the effects of NTBs vary with the size and distance of the country from the importing country.

Moreover, the rates of NTBs costs were higher for farmers in Mbozi District as compared to the rates of NTBs costs in Momba District whereby a farmer in Mbozi district paid a total of TZS 73 per kilogram while farmers in Momba District paid only TZS 48 per kilogram to reach the maize market. It was also found that farmers in the two districts paid the highest costs when seeking for clearance at the weighbridges which amounted to TZS

26 and 18 per kilogram for Mbozi and Momba Districts respectively (Table 10). The higher value of NTBs costs in Mbozi District can be attributed to poor rural roads and long distances, which involve five road blocks to reach the Tunduma markets (about 60 km) which in turn were translated into high transfer costs. This therefore, requires farmers or traders who are transporting maize from Itepula or Shiwinga villages in Mbozi District to Tunduma market to pass through five road blocks located at Igamba, Mlowo, Vwawa, Ihanda, Mpemba. While a farmer or trader from Isanga village in Momba District has to pass only two road blocks at Nkangamo and Tunduma and one weighbridge at Nkangamo village. These findings concur with those in a study by Karugia *et al.* (2009); KI (2011) and Gabagambi (2013) for maize farmers in Tanzania, Kenya, and Uganda.

4.1.7 Prices received by maize farmers with and without NTBs in Mbozi and Momba districts

Table 11 presents the actual prices that farmers could receive in the absence of NTBs in the two districts. The findings indicate that farmers in the two districts could receive higher prices if the government did not impose NTBs on maize trade. This is because the lower prices received by smallholder farmers in the two districts denotes higher transaction costs as attributed to NTBs faced by traders in transporting maize from their villages to the urban markets in Tunduma and Mlowo towns. This is due to the fact that, traders in most cases have a tendency of ensuring that the extra costs they had incurred in transporting maize from the village markets to the district markets are passed back to the farmers in terms of lower prices. These findings are in line with those reported in studies such as KI (2011) and Gabagambi (2013) that revealed that in Tanzania incidences of trade barriers such as NTBs falls on the farmers' shoulders and not to the final consumers as policy assumes. Thus, an increase in the application of NTBs strategies will imply more reduction

to farmers' income through lowering farm-gate prices. Thus, the poverty gap between rural and urban areas will continue to grow.

Table 11: Prices received by farmers with and without NTBs in Mbozi and Momba districts (in TZS/Kg)

District	Price without NTBs	Price with NTBs	NTBs cost	% of NTBs on Farm gate price	Decrease in price due to NTBs
Mbozi	362	290	72.71	25%	72
Momba	369	320	48.84	17%	49
Dar es Salaam	528	550	22.00	04%	22

More interesting, it was found that, the differences in price without NTBs between the two Districts become very small (about TZS 07 per Kg) compared to that with NTBs (about TZS 30 per kg) implying that spatial price differences ,to some extent were created by the imposed NTBs (Table 11). These findings were in line with those reported by World Bank (2009) and Minot (2014) that indicates that the price difference between two spatial markets under market failure is created by transaction costs including those related to NTBs strategies. The findings also are consistent to the transaction cost theory as explained by LOP that the difference of prices between two markets under the market failure is explained by the size of transaction costs involved in transporting a product between them.

In addition, the results as presented in Table 11 indicate further that the contribution of NTBs costs on the producers' prices were very low (only 4%) between the districts and the main consumer markets of Tunduma and Dar es Salaam. While the differences between rural and the district markets (Itepula and Isanga to Tunduma market) was 25% and 17% in Mbozi and Momba Districts respectively. This can be explained by the fact that Tunduma and Dar es Salaam markets are well integrated and connected with good road networks which allow changes in price and information to be transmitted quickly between the two

markets (World Bank, 2012). These findings concur with those of FAO (2013) that show that price margins between Dar es Salaam and Arusha were lower in the period of export ban in year 2011, because the two markets are connected with good road networks and were more integrated.

Moreover, the low prices for smallholder farmers in the rural areas denote higher transaction costs as attributed to poor roads and NTBs encountered by traders and farmers in transporting maize to the urban markets. Furthermore, these findings also concur with those of Karugia *et al.* (2009) and Porteous (2012) on the effects of NTBs on maize trade in East African Countries (EAC) which indicate that the cost of NTBs applied on maize importation into Tanzania was about TZS 187 per ton per kilometre.

4.1.8 Percentage share of different NTBs on market transaction cost as paid by farmers in Mbozi and Momba districts

The percentage shares of different types of NTB costs to the total transaction costs incurred by farmers or traders are shown in Figure 4. The results show that among the NTBs costs paid by farmers or traders in Mbozi and Momba Districts, the costs for clearing produce at the weighbridges constitute the highest percentage (36% and 34% for Mbozi and Momba respectively) followed by police check points where farmers paid about 29% and 25% of the total NTBs costs. This is because the weighbridges and police check points were reported by traders and transporters to be fertile ground for the extortion of bribe by the police and local government officials (Haug and Hella, 2013; Gabagambi, 2013).

On the other hand, the costs of NTBs paid to get cleared through customs at the border posts for traders who exported maize to the neighbouring countries were found to be similar (17%) for farmers from both districts. This is because all the farmers from the two districts

go through the same custom procedures at the border points at Tunduma and therefore they pay the same amount to get over the obstacle. In addition, the higher percentage of the costs paid at the custom check point was attributed to long hours which are spent in getting clearance documents as required by the TRA officers. During the FDG sessions and interviews with KIs in Momba District, it was found that a trader could take more than one hour to acquire all the documents necessary to pass across the border point at Tunduma. This situation on the other hand, cultivates an environment for corruption involving traders, transporters and customs or police officers.

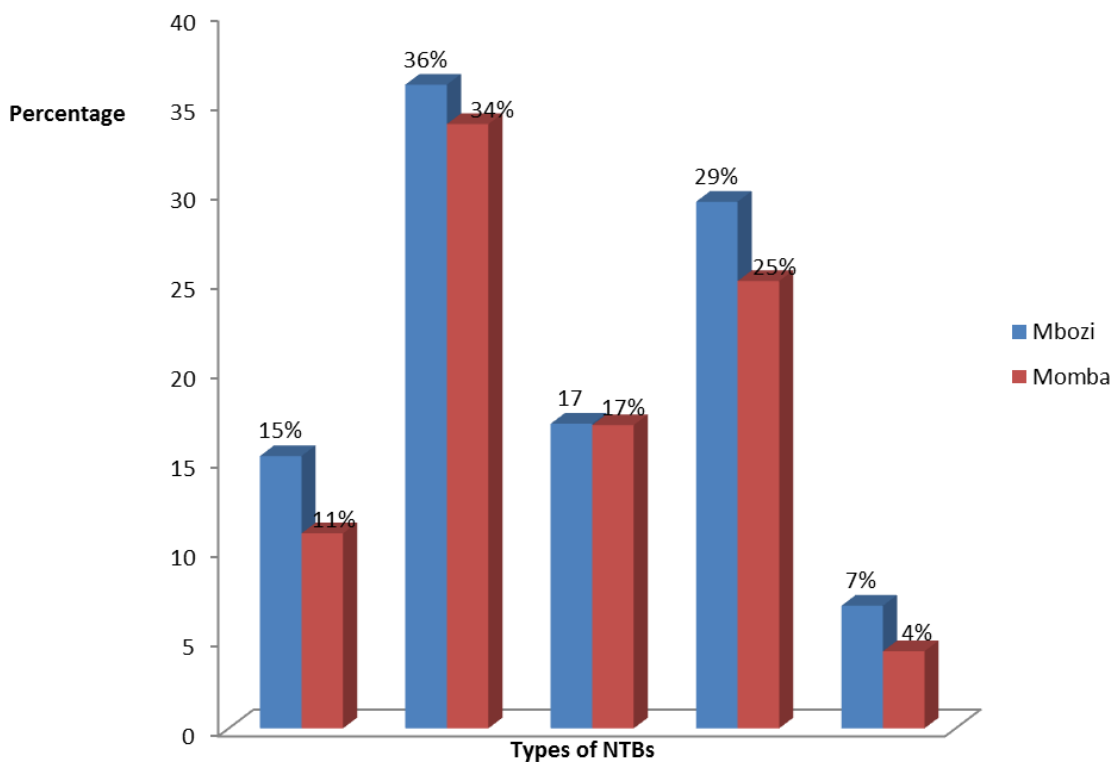


Figure 4: Percentage share of individual NTB as incurred by farmers in Mbozi and Momba districts

These findings are in line with the findings reported by Gabagambi (2013) and Minot (2014) who found that, in Tanzania traders take more than an hour to cross a border as

opposed to Uganda where traders were spending more than two hours or more to cross a border, as reported by Okumu and Nyankori (2010).

Furthermore, the findings presented in Figure 4 indicate that the costs incurred by farmers and traders at road blocks amounts to 15% and 11% of the total costs for Mbozi and Momba Districts respectively. These findings imply that farmers in Mbozi District were paying more on road blocks than did farmers in Momba District. The differences between the two districts can be explained by the differences in distance from these two districts to Tunduma market: Mbozi District is located far away (about 60km) from Tunduma market and therefore farmers or traders have to pass through five road blocks. Also, the high percentage of roadblocks can be attributed to the fact that they (roadblocks) are frequently used as a tool of tax collection by many Local Government Authorities (Msuya, 2011; Gabagambi, 2013). These findings concur with those in a study by Gabagambi (2013) who found that, farmers in Kiteto and Kongwa Districts were constrained with cumbersome NTBs obstacles including road blocks and weighbridges to reach Kibaigwa international maize market. The author reported further that a trader or a farmer has to pass through 6 road blocks to move maize from Kiteto to Kibaigwa market. Also, road blocks were reported to be the main causes of unnecessary disturbances and delays for traders in Kiteto and Mbarali Districts (Msuya, 2011).

However, the introduction of prohibitive road blocks goes against the government's commitment of promoting agricultural revolution based on commercialization and modernization. In this regard, KI (2011) and Karugia *et al.* (2009) found that the number of road blocks for maize trade was higher in Kenya (about 11) than was the case in Tanzania (6). This implies that NTBs in the form of road blocks are still hampering market access for smallholder farmers in Tanzania especially in the rural areas and thus presents a potential

disincentive to the production and investment in the maize sector as compared to other sectors.

Moreover, farmers indirectly paid for about seven and four percent in securing the local buying permits from Mbozi and Momba Districts respectively. The difference in the amount of money paid by traders on council permit is due to the fact that in Tanzania there is no uniform rate at which the District Councils are supposed to charge on agricultural outputs. Likewise, the former Tax law was not clearly specified which agricultural products are liable for levy, tax, or cess (Gabagambi, 2013; FAO, 2013). This provides a room for each District Council to set its own rate of charging levy or cess as determined in their by-laws. Moreover, the previous Tax law (2006) had only given Local Government Authorities the ceiling rate of charging levy which was not more than 5% on agricultural products (Gabagambi, 2013; ACT, 2010). However, despite that the 2016 Tax law reduced the levy rate (producer cess) for staple food crops (including maize) from 5% to 2 percent in Tanzania; the law is subjected to different interpretations by different Local Government Authorities (LGA). For example, some LGAs were charging tax as the percentage of the buying price; others charged it as a fixed amount per kilogram of produce. This makes traders or farmers from different districts to pay different tax rates. For example, as Msuya (2011) observes, the rates charged for maize cess Kongwa and Kiteto Districts were different; for example, in Kiteto District the rate was set at 2.5% while in Kongwa District the maize cess was set at 5 percent. Similarly, the produce cess rates for Njombe and Mbarali Districts were set at 3 percent.

4.1.9 Contribution of NTBs costs on the total transfer costs incurred by farmers in marketing of maize

The contribution of NTBs costs on the total transfer costs incurred by farmers in marketing of maize presented in Figure 4 was for the individual NTB on transaction and market costs. However, the study also estimated the percentage contribution of NTBs in aggregate as a single variable in the total transfer costs which also includes transaction costs. The findings indicate that NTBs costs accounts for about 42% of the total transfer costs (Figure 5). The rest of the percentages comprise transport costs (58%) paid by farmers or traders in transporting their maize to Tunduma or Mlowo markets in Momba and Mbozi Districts. This percentage (42%) is higher than 13 percent, which was reported by Karugia *et al.* (2009) for Tanzania. This implies that the efforts of improving market access for farmers and traders through reduced NTBs in Tanzania are still undermined. Moreover, the estimated share of NTBs (42%) is high enough to add a burden to poor farmers in rural areas and the final consumers in the urban areas. This percentage calls for a quick government intervention on addressing distractive NTBs obstacles in the rural area so as to encourage maize production and trade for improving food security.

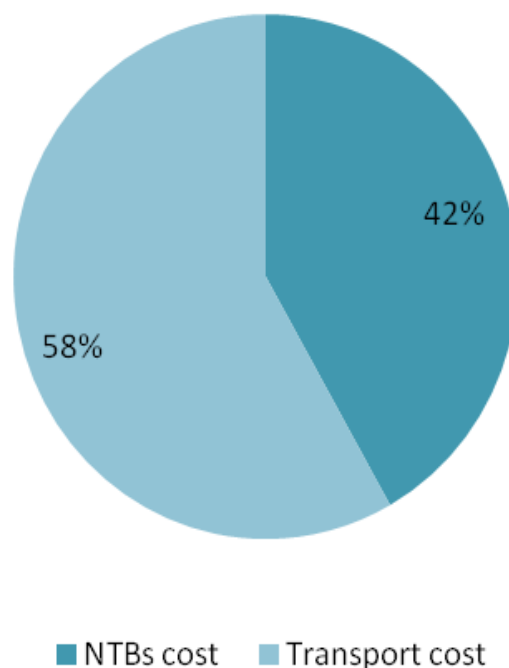


Figure 5: Percentage of NTBs on total marketing costs in the study area

4.2 Effect of NTBs on Households' Market Participation and the Intensity to Participate in the Market in the Study Area

4.2.1 Effect of NTBs on market participation decisions for farm households

Table 12 presents the effects of NTBs and other factors on the probability of households to decide to participate in the maize markets in Mbozi and Momba Districts. The study used the two-stage Heckman model of analysis whereby in the first stage, the Probit regression was carried out to estimate the effects of NTBs and other households socio-economic characteristics on farmers' decisions of whether or not to participate in the market. The dependent variable (farmers' decision to participate in the market) was computed as a binary variable from the quantity of maize sold such that $Y^* = 1$ if $S_i > 0$ and $Y^* = 0$ if $S_i \leq 0$, where Y^* is a marginal utility that households could derive from participating in the market; and S_i is the quantity of maize sold by the households in Kilogram (Kg).

The findings in Table 12 indicate that education level of the household heads, family size, market price, experience in marketing and the number of livestock owned by farmers had a significant positive relationship with the decision of farmers to enter in the maize market in Momba and Mbozi Districts. On the other hand, NTBs and distance to the district market had shown a significant negative relationship with farmer's decision to participate in the markets. Furthermore, the education level of the household head positively influenced farmers' decision to participate in the maize market and was significant at 10% level ($P = 0.029$). The positive coefficient on education implies that the increase in the number of years that households spent in schooling could increase their likelihood of participating in the market. This observation was revealed by the marginal effect of education level for the

household head of 0.0312 implying that a unit increase in the level of education by the household head would increase the probability of the household to enter the market by 3 percent. This is because high levels of education empower farmers into accessing more information about the market and the existing new opportunities from various markets. Access to market information makes a farmer more informed about market requirements in terms of price, quality, and the right quantity of maize which is needed by buyers (Bwalya *et al.*, 2013).

Table 12: Probit results on the effects of NTBs on the decision of farm households on market participation in the study area (N= 400)

Variables	Parameter Estimates		Marginal Effects	
	Coefficients	Std. Error.	dy/dx	Std-Error
age of HH head (Years)	-0.025**	0.013	-0.0095	0.0051
Education level of HH head (No of year in school)	0.081*	0.029	0.0312	0.077
Family size (No. of person)	0.056**	0.057	0.0144	0.0221
NTBs Equivalent (TZS)	-0.464**	0.164	-0.1590	0.1851
Experience in maize market (Years)	0.034*	0.015	0.0132	0.0058
Distance to district market (Km)	-0.059**	0.018	-0.041	0.0069
Quantity of maize produced (Kg)	0.001	0.001	0.0001	0.0003
Area located for maize (Acres)	0.103	0.165	0.0395	0.0637

Ownership of bicycle by household (Yes=1, No = 0)	-0.138	0.195	-	0.07538
			0.0532	
No. of livestock owned by household (numbers)	0.089**	0.051	0.0344	0.01965
Market maize price (TZS/Kg)	0.669*	1.024	0.2582	0.39513
Ownership mobile(Yes =1, No = 0)	0.095	0.162	0.0366	0.06258
Sex of household head (Male=1 Female=2)	-1.116	0.351	-	0.13571
			0.4304	
Constant	4.235***	6.386		
Prob > chi2 =	0.000			
Pseudo R2 =	0.363			
Log likelihood =	-105.586			

Dependent variable: Farmers' decision to participate in market ($Y^* = 1$ if $S > 0$), *, **, and *** denotes significant level at 10%, 5% and 1% respectively.

These findings are consistent with those reported in a study by Sebatta *et al.* (214) who found that smallholder farmers with high level of education were more involved in selling their produce to the market in Nigeria. Similarly, the findings concur with those reported by Odulaja and Kiros (1996) and Ohajianya and Ugochukwu (2011) who revealed that farmer's ability to produce and sell more output to the market was positively related to their education levels. But the findings were in contrast with those reported by Musah *et al.* (2014) who found that an increase in the education level of the household head was negatively related to the farmers' decision to participate in the market in Ghana.

In contrast, NTBs costs had shown a depressing effect on the probability of households to participate in the market and was significant at 5% ($P = 0.004$). The possible explanation for the negative relationship is that the introduction of NTBs along the maize supplies chain may lead to increased transaction costs which a farmer or a trader has to incur to access different markets. Moreover, high transaction costs have a high probability of reducing the ability of farmers to transport maize to the markets. The marginal effects of NTBs was

0.16 implying that a unit increase in the costs derived from the NTBs would reduce the probability of farm household to enter the market by 16 percent. These findings are in line with those by Musumba and Costa (2015) who found that higher transaction costs especially in the rural areas in Tanzania which are caused by poor roads and NTBs, are limiting farmers from accessing the markets in the urban centres.

Age of the household head was also found to negatively influencing the decisions on market participation among smallholder farmers and was significant at ($P = 0.006$). The negative relationship which is shown by this variable could be due to fact that the older households tend to be risk averse than younger household heads. Therefore, older household heads may opt to wait for buyers at home or farm as opposed to younger household heads that are likely to travel to town and sell their maize to traders. In addition, older household heads have limited access to market information whereby younger household heads could sell a relatively large portion of their product through better access to price information (Demeke and Haji, 2014). The marginal effect for age of the household head was - 0. 0095 implying that a unit addition in the years of the household age would almost not influence the decision of farmers to enter the market.

Furthermore, market experience of farmers also showed a positive influence on farmers' decision to participate in the market and was significant at 10% (Table 12). This implies that the more experienced on marketing the households become the more likely it becomes for them to decide to inter the market. The marginal effect of market experience was 0.0132 implying that a unit increase in the number of years in market experience would increase the probability of the household of participating in the maize market by one (1) percent. This is because spending more years in maize marketing makes the farmer incur less costs on information searching due to the prevalence of well-established social networks a farm

household has created with buyers (Makhura *et al.*, 2001; Bwalya *et al.*, 2013). Therefore, older farmers have a higher probability of participating in the market because they have more market information and thus incur less fixed transaction costs which originated from searching and bargaining with a proper buyer. Similar findings are reported by Makhura *et al.* (2001) and Bwalya *et al.* (2013) who reveal that experienced households have more contacts and trust gained through repeated exchange with the same parties at the market, and this enables them to reduce fixed transaction costs on searching and bargaining with the potential traders.

In addition, households who owned more livestock were found to be more involved in selling their maize in the markets as compared to those who own less livestock. The marginal effect of the number of livestock owned by household head was 0.034 implying that a unit increase in the number of livestock owned would increase the probability of the households entering the market by 3 percent. This is because cattle such as oxen were found to be used in pulling ox-carts of maize to the markets as the major means of transport for the majority of farmers in Mbozi and Momba Districts. Therefore, ownership of these assets to some extent would contribute in reducing the costs of transportation from the farms to the markets and thus raising the ability of a farmer to participate in the market. These findings concur with those reported by Ohajianya and Ugochukwu (2011) in Nigeria that farmers who owned large number of livestock were more likely to participate in the market as sellers and not autarky.

These findings are also in line with the findings in a study by Randela *et al.* (2014) who revealed that households with own means of transport are likely to transport their agricultural product in time to the market and earn more income before losing value. Likewise, Ismail (2014) also found that market participation for smallholder maize farmers

in Kongwa District were statistically significantly related to the storage facilities such as warehousing, parking areas, and drying areas. This implies that the availability of improved facilities such as buildings, parking area, weigh machine, warehouse, and drying area attracted more smallholder farmers to participate in the market in the district. In contrast to these findings, Jaleta *et al.* (2009) found a negative relationship between asset ownership and market participation by smallholder cassava farmers in Mozambique.

Furthermore, the result in Table 12 indicate that market price for maize had a positive influence on farmers' decisions to participate in the maize market and was significant at 5% level. This implies that farmers, in most cases do respond quickly to high prices as they are translated to higher income earned from maize selling and thus enable them to enquire more other resources for production operations. The marginal effect of market maize price was 0.258 implying that a unit increase in the price of maize would increase the probability of a household to enter the maize market by 26 percent. Thus, farmers in most cases would be more likely to participate in the market if the prices they receive from traders are higher than the costs of production. This observation concurs with the economic theory that an output price is an incentive for farm household to supply more produce for sale in the market (Musah *et al.*, 2014). Similarly, these findings coincide with those by Ismail (2014) who found that availability of markets with good prices influenced more farmers from Kongwa district to sell more of their maize produce instead of storing them. Therefore, a policy which intends to improve agricultural price could be the best alternative for the improvement of market access among smallholder farmers'.

Additionally, during FGD with farmers and traders it was reported that before the ban of maize export in 2008 and 2011, the quantities of maize sold were higher as compared to the current period in the two districts. This was due to the decrease in maize prices caused by

the ban on maize export to the neighbouring countries. These findings are also consistent with those reported by Omit *et al.* (2009) and Enete and Igbokwe (2009) who revealed that better output price was the key incentive for farmers' participating in the market. Similar results were obtained by Olwande and Mathenge (2012) in Kenya that farmers sold more maize during the period of higher market prices. Also, the findings from a study by Sebatta *et al.* (2014) indicate that prices had a positive relationship with the decision of households to participate in the market.

The marginal effects of family size was 0.144 and significant at 10% ($P = 0.08$) implying that, the probability of farmers to participate in the market could increase by 14% with the one addition of adult person at the family. This is because households with more adult people have high ability to produce more maize and therefore can sell more surpluses to the market. This observation concurs with the findings by Makhura *et al.* (2001) and Bwalya *et al.* (2013) who revealed that the likelihood of a farmer to sell and participate in the market increases with an increase of the number of persons at the family. These findings also are in line with the theory of labour supply which state that, the supply of labour would increase with an increase in the number of adults at the household family.

In contrast, distance to markets for smallholder farmers was found to negatively influence households' decision to participate in the market and was significant at 5% ($p=0.003$). The marginal effect of distance to the market was 0.0411 implying that a unit increase in kilometers to the markets would decrease the probability of a household to participate in the maize market by 4 percent. This can be explained by the fact that those smallholder farmers who are located far away from the market place have to incur more transaction costs as compared to those who stay closer to the urban markets. These findings concur with those reported by Bwalya *et al.* (2013) and Sebatta *et al.* (2014) in Zambia and Nigeria

respectively who found that distance to the market was negatively related to the farmers' decision to participate in the maize and potato markets. On the other hand, short distances from the farmers' premises to the markets could imply less transaction costs to smallholder farmers and therefore would encourage more participation in the market. In this case, farmers who live far from markets would have difficulties in accessing better prices from the buyers due to high transaction costs as attributed to NTBs.

These observations also are in line with those reported by Osebeyo and Aye (2014) who conclude that households that live closer to the market outlets are more likely to participate in marketing operations than households living farther away. This is because of high transaction costs which lower the effective price received by the farmer (seller); thus, discouraging him/her from participating in the market. For example, farmers from Itepula village (15km from Mlowo maize market) in Mbozi District reported to incur TZS 3 000 per bag of 100kg (equivalent to \$2.00) to reach the town market at Mlowo. These costs are too high for poor smallholder farmers such as those in Mbozi and Momba Districts to overcome and access markets for their produce. This situation force farmers to sell their maize produce at home right after the harvesting period commences.

4.2.2 Effect of NTBs on the intensity of market participation by maize farm households

In the second stage of the Heckman model, the OLS technique was employed in estimating the effects of NTBs on the intensity of market participation by smallholder farmers in Mbozi and Momba Districts. The intensity of market participation was measured by the quantity of maize sold by households in kilograms in the urban markets. Table 13 presents the variables that influence the intensity of market participation among maize farmers in the

two districts. Out of 12 variables which were fitted in the model, seven were significant plus the Inverse Mills' ratio (IMR) which was used in correcting the selection bias problem.

The results indicate that education level of the household head, the quantity of output produced, the number of livestock, and the market maize price were statistically significant at 5 and 10 percent. While NTBs costs, the age of the household head and distance to the district markets were found to negatively influence the intensity of market participation and were significant at 5 percent. The Inverse Mills' Ratio was also significant at 1 percent implying that the data had a problem of selection bias and therefore the Heckman two-step was the correct model to use because of its ability to handle selection bias problem. The constant was also positive and significant at 1 percent, implying that the factors which were not included are positively affecting the intensity of market participation.

Table 13: Effect of NTBs and other factors on the quantity of maize sold by smallholder farmers in the study area (N= 400)

Variables	Coefficients	Std. Error.	t- Value	Sig
Age of HH	-1.399*	1.615	-1.77	0.079
Education level of HH (Years spent in schooling)	1.505*	0.835	1.35	0.067
Family size	2.123	1.334	0.22	0.839
NTBs Equivalent	-0.157**	2.47	2.46	0.007
Experience in maize marketing (Years)	1.154	0.960	2.06	0.442
Distance to district market (Km)	-0.646*	0.864	-1.78	0.051
Quantity of maize produce (Kg)	0.664**	0.021	-2.42	0.009
Area located for maize (Acres)	0.602	0.383	0.81	0.422
Number of livestock owned by household (Numbers)	0.453**	0.074	2.85	0.005
Ownership of bicycle by household (Yes =1 No = 0)	0.736	0.638	-0.93	0.455
Average maize price (TZS/Kg)	0.452**	0.908	2.47	0.009
Sex of household head (Male =1 Female =2)	-0.6182	0.699	-0.84	0.645
Constant	1.327***	3.265	2.74	0.000
Inverse Mill's Ratio (IMR)	4.11***	0.548	3.36	0.000
R-square			0.610	
prob> chi2			0.000	

The results in Table 13 indicate that the NTBs had a depressive effects on the amount of maize sold by households in the market and was significant at 5 percent ($P = 0.007$). The value of the marginal coefficient for NTBs was 0.157 implying that a unit increase in the cost derived from the NTBs could reduce the amount of maize which households could sell in the market by 16 percent. This is because the introduction of NTBs strategies on the marketing of agricultural produce such as maize increases the magnitude of the transaction costs and thus reduces the probability of households from participating in the market as sellers. The increase in the transaction costs on the other hand could reduce the ability of farm households to transport their maize to the district markets and hence sell less amount of maize. These findings are in line with those reported by Musumba and Costa (2015) who

found that higher transaction costs especially in the rural areas in Tanzania caused by poor roads and NTBs limit farmers' access to the markets in the urban centres. Moreover during the interview with farmers, it was also reported that farmers were required to pay TZS 1 000 per bag per trip when crossing any road block in Momba and Mbozi Districts. These costs are too high for farmers who incur high costs of inputs and receive low farm-gate prices from traders which in the years 2013 and 2014 were on the average of TZS 250/kg in the two districts.

These findings also conform to those reported by Mbise *et al.* (2010) who revealed that in Tanzania, NTBs are the major contributors of transaction costs in the exchange process at a particular market. The findings are also in line with those reported by Porteous (2012) and Karugia *et al.* (2009) that NTBs policy increases the total costs incurred by traders in transporting their maize produce to the markets by 13% and 34% in Tanzania and Kenya respectively. Therefore, NTBs in this respect, will act as impediments against smallholder farmers especially in the rural area from accessing different markets both in the local and across the country borders. Moreover, these findings were in line with the descriptive findings which indicate that the majority (81%) of farmers were reported to conclude their transactions at home in Mbozi and Momba Districts due to high transaction costs (Table 7).

Furthermore, coefficient of distance to the market showed a depressing effects (-0.646) on the quantity of maize sold by farm households and was significant at 10 percent (Table 13). The negative coefficient of distance indicates that the ability and likelihood of farmers to participate in the market and sell more quantities of maize could decrease by 64% for the unit increase in kilometre to the market from the households' homesteads. These findings are in line with those reported by Sebatta *et al.* (2014) who found that in Nigeria, the

distance to the market negatively related to the amount of potatoes that farmers wish to sell to the markets. Distance to market was also reported by farmers from Isanga village during the FGD located in Momba District (40 km to Tuduma maize market) as a reason as to why traders offer low farm-gate prices for their maize produce. This is because transaction costs incurred by traders in the actual sense are transferred to or paid by farmers in terms of low farm gate prices they receive (Gabagambi, 2013).

Education level of a household head also showed a positive relationship to the quantity of maize sold and was significant at 10 percent. The positive relationship of education to the intensity of market participation indicates that farmers with higher level of education are more likely to participate in the market as sellers because of having more market information as compared to those with low level of education. These findings were in conflicting with those reported by Ohajianya and Ugochukwu (2011) and Musah *et al.* (2014) who revealed that sweet potatoes and maize farmers who are more educated are more likely to be buyers than sellers in the Southern Eastern of Nigeria and Ghana.

In addition, ownership of livestock such as oxen and donkey had a positive relationship to the quantity of maize sold by smallholder farmers. This implies that a farmer with such assets could incur relatively low transaction costs in transporting maize to the markets than those who do not own such assets. This is because domestic animals such as oxen and donkeys were used as the means of transporting of maize from the production areas to the markets. Therefore, livestock are important production shifters because they increase the capacity of a household to produce surpluses and hence increase their chances of participating in the market (Barrett, 2007). Moreover, having more person assets such as car and ox-carts could also contribute more in reducing the transaction costs which arise from the imposed NTBs such as road blocks and weighbridges. These findings concur with

those reported by Pravakar *et al.* (2010) who found that households with larger livestock endowments such as cattle produced and sold more maize to the market. Similar findings are reported by Bwalya *et al.* (2013) who found that households that owned ox-carts in Zambia marketed about 2 200 kg more than those who did not own ox-carts. The findings from this study also are in line with the ones reported by Boughton *et al.* (2007) in Mozambique who found that private ownership of assets such as livestock and farm equipment were positively related to the amount of grain crops which were marketed by smallholder farmers. Moreover, ownership of person means of transports such as bicycle, motorbikes, and cars will increase the number of households who participate in selling maize due to reduced transaction costs. These findings were consistent with those reported by Sebatta *et al.* (2014) who found that ownership of assets such as transport equipment (ox- carts, pick up) tends to reduce entry barriers to the market.

The amount of maize produce was found to increase the quantity of maize sold by households and was significant at 5 percent ($P = 0.009$). This can be explained by the fact that households with more harvests will have more surpluses to sell to the market as compared to those with little harvests. Therefore, the quantity produced is considered to be a critical prerequisite for semi-commercial farmers who first have to produce for home consumption and only sell the surplus in the market (Sebatta *et al.*, 2014). The marginal coefficient for the quantity of maize produced was 0.664 which implies that the unit increase in the quantity produced could increase the quantity of maize sold in the market by 66% in the study area. Therefore, large sizes of outputs could enable households to have more marketable surplus in the market (Jaleta *et al.*, 2009). These findings concur to those reported by Sebatta *et al.* (2014) and Olwande and Mathenge (2011) that farmers who manage to produce more harvests are more likely to sell more maize to the markets in Nigeria and Kenya respectively. Also, Haug and Hella (2013) found that farmers in the

surplus areas of Songea in Ruvuma region sold larger volumes of maize in the market than those in the deficit areas such as Dodoma and Singida.

Furthermore, the market price was found to be positively influencing the quantity of maize sold in the market by farm households and was significant at 5% ($p = 0.009$). The positive coefficient of 0.452 implies that a unit increase in the market price for maize in the urban markets could increase the quantities which households could wish to sell in the market by 45 percent. This is because price is the most important motivational factor for farmers' decisions to enter the market as sellers (Bwalya *et al.*, 2013). These findings are consistent with those reported by Komarek (2010) who found that the output price positively influenced the intensity of market participation among banana producers in Uganda. The findings are also in line with those reported by Omiti *et al.* (2009) who revealed that the output price influenced positively the intensity of market participation among maize and kale producers in peri-urban areas of Kenya.

4.3 Effect of NTBs on the Price Received by Smallholder Farmer in the Study Area

4.3.1 The effect of NTBs on farm-gate price among smallholder farmers in Mbozi and Momba districts

To determine the spatial effect of NTBs on the price received by small holder farmers in the two districts, the distance from the village to Tunduma maize market was used as a reference point. This is because Tunduma market is located along the border of Tanzania and Zambia through which maize from the two districts is sold and sometimes transported across the border to Zambia, Malawi, and the DRC. The regression results as presented in Table 14 indicate that NTBs had a negative influence on the price received by farmers in both districts. Furthermore, the effects of NTBs on the price were higher in Mbozi District

than were in Momba District. The coefficients of NTBs show that farm gate prices could decrease by 7% in Mbozi District with a unit increase in NTBs cost while in Momba District the prices only decreased by 5 percent. In other words, the prices of maize in Mbozi District were lower than those in Momba District by 2.2 percent whereby the differences represents the NTBs costs. The possible explanation for such differences is the spatiality whereby most of the villages which were involved in this study from Mbozi District were located far from Tunduma border as opposed to the villages in Momba District. For example, Itepula and Shiwinga villages in Mbozi are located about 60 km away from Tunduma maize market. This distance forces traders to pass across five (5) road blocks and one weighbridge at Mpemba village, when transporting maize to Tuduma market in Momba District. These barriers are reported by traders to be time consuming and therefore traders are attempted to pay bribes to officials in order to reduce the time wastage at the barrier (Gabagambi, 2013; Ismail, 2014).

Table 14: The effects of NTBs on farm-gate price among smallholder farmers in Mbozi and Momba districts

Variable	Mbozi District			Momba District		
	Coefficient	Std error	t -Value	Coefficient	Std Error	t -Value
Constant	-10.095**	2.983	-3.384	5.073***	1.256	4.038
International price (TZS/Kg)	0.236**	0.051	2.304	0.408***	0.103	10.012
Price at the urban market (TZS/Kg)	2.277***	0.513	4.434	0.150	0.183	0.818
Seasonality Dummy (1= Harvest season, 0 = Lean season).	-0.143**	0.048	-2.996	-0.172***	0.026	6.660
NTBs costs (TZS/Kg)	-0.067*	0.020	-2.292	-0.045**	0.020	-3.389
Distance from village to border market (Km)	-0.222***	0.027	-8.198	-0.140***	0.014	-9.743

Dependent variable: Farm -gate price received by farmers (TZS/Kg), International price was taken at FOB for period 2010 – 2013. Exchange rate averaged at 1\$= 1578 TZS. ***, ** and * denote significant level at 1%, 5% and 10% respectively.

These findings are in line with those reported by the World Bank (2012) and Minot (2014)

who found that in Africa smallholder farmers who sell surplus harvests to the nearby markets typically receive less than 20% of the consumer prices of their produce, with the rest being eaten up by transaction costs related to NTBs and post-harvest losses. These observations are also in line with the descriptive findings from this study which reveal that about 42% of the market transaction costs comes from NTBs and 58% originate from transportation costs (Figure 5). This implies further that rural farmers in Tanzania, who in most cases are located along poor road networks, are likely to continue receiving the lowest prices as opposed to their counterpart traders. These observations are consistent with findings reported by FAO (2013) who revealed that maize farmers from the rural areas in the Southern Highlands of Tanzania received the lowest producer prices in the year 2011 as opposed to those in the Northern parts. The lowest prices in the Southern Highlands of Tanzania could be attributed to poor road networks leading to high transaction costs, which traders deduct on the farm-gate price.

In addition, the differences in the NTBs effects between the two districts can also be attributed to the existence of informal cross border trade which facilitates the movement of maize from Momba District to the neighbouring countries such as Zambia, Malawi, and the DRC. For example, during the interview with KIs, it was found that the quantities of maize which is informally traded from Tanzania to Zambia through Tunduma border increased from 2 449 MT in 2009 to 3 730MT in year 2010 because of the export ban on maize trade in 2008 (KI, 2011, FEWS NET, 2012). These informal transactions had adverse effects on the introduced NTBs such as export bans, road blocks, and custom procedures to both traders and farmers who are located closer to the border posts (Minot, 2010; FAO, 2013).

On the other hand, the distance from the villages to Tunduma market had shown a depressive effects on the farm gate prices and was significant at one percent ($P = 0.000$). This implies that the prices received by farmers will decrease with an increase in the distance to the market. The findings indicate further that the prices received by famers in Mbozi District will be less as opposed to those received by farmers in Momba District which is closer to the market. This was also reflected by the differences in the size of distance coefficients for the two districts. The maize prices in Mbozi District fell by 22% for a unit increase in distance kilometre while that in Momba District fell by 14 percent (Table 14). This is because farmers in Momba District were closer to the market and therefore they could access the markets at lower transport and transaction costs resulting from the imposed NTBs.

These findings are in line with those reported by World Bank (2009) and Moctar *et al.* (2015) who revealed that transaction costs generally increase with an increase of the distance making the arbitrage (trade between markets) more costly. Also, the findings concur with those reported by Omiti *et al.* (2009) who found that the households that were located in the urban centres received higher prices and sold more produce than those who were in the rural areas because the former could access markets at lower transportation and transaction costs than the latter. This situation was also revealed by the higher average farm-gate price of TZS 360/Kg for Ihanda and Mpemba villages which were located closer to the border market and the lowest price in Shiwinga village (about 60km to Tunduma market) which had an average of TZS 250/kg in year 2014. Therefore, farmers at Shiwinga village in Mbozi District earned less income from maize sales as compared to those in Mpemba and Chiwanda villages in Momba District due to incurring of more NTBs costs in terms of roadblocks, council permits, and weighbridges.

Moreover, maize producer prices in Mbozi District were responding more to change in the prices in the urban markets such as Mlowo and Tunduma centres as opposed to maize producer prices in Momba District. The coefficient of maize prices in the urban market of Mbozi District was 2.28 and significant at one percent (1%) implying that the prices received by farmers could increase by 23% for every 10 unit increase on the price in the urban market (Table 14). These findings concur with those reported by Mkenda and Van Campenhout (2011) and Moctar *et al.* (2015) who found a positive relationship between prices in the rural and urban markets in Tanzania. In contrast to this, urban maize prices were found to be insignificantly related to producer prices in Momba District. This could be explained by the reality that Momba District is closer to the border market in Tunduma town centre leading to small margins in price variation.

The producer prices were also found to increase with changes in the international price (valued at f.o.b) in the two districts whereby a unit increases in the international price could lead to an increase of 40% in the maize prices in Momba District. Conversely, the effects of international price change could not be truly realized by the majority of smallholder farmers in the rural areas because of weak market integration between production areas and the central markets in the urban areas. These findings concur with those reported by Kilima *et al.* (2008), World Bank (2009), and FAO (2013) who found that maize markets in Tanzania, especially at the farmers' level, are weakly integrated with consumer markets and international prices. This reduces the price transmission effect from urban to rural markets where farmers sell their produce.

4.3.2 Comparison of the effects of NTBs on maize price received by smallholder farmers in Mbozi and Momba districts

To compare the mean effects of NTBs costs on price received by smallholder farmers between the two districts, the study employed an independent sampled t-test. The independent sample t-test was selected because the two groups of farmers were found to have different sample means and therefore the independent t-test was an appropriate tool for comparing the two groups (Sounders *et al.*, 2009). Table 15 presents the results from independent sample t-test analysis which compared the statistical relationship for the effects of NTBs costs on farm gate prices among farmers between the two districts. The results show that there was a statistically significant (at the 5 % level) difference between the mean NTBs effects on farm gate prices as experienced by farmers in the two districts (Mbozi and Momba). These effects were higher for farmers in Mbozi District (as indicated by mean 6.47) than that of their counterpart farmers in Momba District (with mean 6.27). This is because more NTBs costs were incurred by farmers or traders in Mbozi District to reach Tunduma market as a result of poor rural roads and long distances. However, the lower effects of NTBs in Momba District can be attributed to the close proximity of the district to border and the prevailing of informal cross border trade as explained early.

These findings are consistent with those reported by World Bank (2009) and Minot (2014) who found that in Tanzania, the effects of transaction costs as experienced by farmers and traders vary with the spatial distance between the markets. Basing on these findings, it can be argued that NTBs have more effects on maize prices for the farmers who are located far from the district markets such as Mbozi and have fewer effects on farmers who are located closer to the border urban markets such as Momba District.

Table 15: t-test results for comparing the mean difference of NTBs effects on maize prices between Mbozi and Momba districts

District	N	Mean	Std. Deviation	Std. Error Mean	T value	Sig. (2-tailed)
Mbozi district	240	6.4749	0.30290	0.02560	4.061	0.000
Momba district	160	6.2791	0.40845	0.04084		
Eta Square						
					0.107	

Furthermore, the significant differences on the effects of NTBs between the two districts motivated the current study into wishing to understand the magnitude (size) of their mean effects on farm gate prices. Thus, to accomplish this objective, the Eta Square was used in the estimation of the magnitude size) of the NTBs effects in the two districts. The results from the Eta Square formula (49) indicate that the magnitude of the NTBs effects on the price received by farmers between the two districts was large enough to create a burden to farmers. This was implied by the value of Eta Square of 0.107 (Table 15) which in accordance to Cohen (1988) shows the existence of large effects of NTBs costs on farmers' prices. Therefore, the results from t-test and Eta Square enabled the study to reject the null hypothesis and not to reject the alternative hypothesis that there is a difference in NTBs effects on the prices received by farmers in the two districts.

However, the large differences on the effects of NTBs costs experienced by farmers between the two districts has policy implications that the implementation of NTBs strategies by the government in the forms of road blocks, council permits, and weighbridges would hurt more farmers in the rural areas of Mbozi District than would be the case with farmers in Momba District. This is because farmers in Momba were close to the market and therefore have more alternatives of transacting their maize products such as informal trading across the borders. These findings concur with those reported by Hella *et al.* (2011) who found that farmers who live in the remote villages with poor access to market in Tanzania were the main losers of the increase in prices caused by food crisis in 2008. Similarly, these findings concur with those reported by Moctar *et al.* (2015) in Burkina

Faso that farmers who are located far from the urban markets received the lowest farm gate prices as opposed to those located closer to the urban markets. This was due to high transaction costs incurred by traders in transporting agricultural products from the village to the urban centres which in turn were deducted from the producer prices offered to farmers.

4.4 Effects of NTBs on Production and Marketing of Maize in Mbozi and Momba Districts

The empirical results from the supply function derived from profit function using duality model are presented in Table 16. The estimates from the supply function show that the coefficients of most of variables have the hypothesized signs and were statistically significant at 1, 5, and 10 percent levels. However, the computed elasticities estimates indicated that the NTBs have an inverse relationship with the quantity of maize produced and supplied with the coefficient valued at - 0.162 and were significant at ten percent. This implies that the quantity of maize output produced by farm households could decrease by 16% with a unit increase in the transaction costs as attributed to NTBs in terms of road blocks, weighbridges, police check points, custom procedures, and council permits. The depressive effect of NTBs on maize production on the other hand, could reduce the ability of farmers to produce and supply more outputs to that market. This situation in turn could discourage farmers from investing more resources on maize production in the long run and thus affecting their supply responses. These findings concur with those reported by KI (2011) and World Bank (2012) which found that the presence of NTBs in Tanzania reduced the ability of smallholder farmers to produce and supply more maize to the markets. The findings are also similar to those reported by FAO (2013) that maize producers in Tanzania are discouraged from producing more because of the ad hoc government interventions on maize marketing in the form of trade barriers including NTBs.

Table 16: Regression results on the effects of NTBs on production and supply of maize in the study districts (N= 400)

Variables	Coefficients	Std. Error	t-Statistics	P-Value
Land size allocated for maize production (Acres)	0.813***	0.086	9.447	0.000
Maize market price (TZS/Kg)	0.699**	0.248	2.816	0.005
Price of improved seeds (TZS/Kg)	-0.552*	0.277	-1.993	0.047
Application of fertilizers (Kg/ Acre)	0.133	0.088	1.522	0.129
Family Size (No. of persons)	0.297**	0.101	2.945	0.004
Seasonality (Good =1 Poor =2)	0.335**	0.093	3.612	0.000
Labour wage rate (TZS)	-1.340**	0.392	3.422	0.001
NTBs equivalent (TZS)	-0.162*	0.095	-2.274	0.024
(Constant)	-4.478**	2.920	-2.534	0.007
R Square	72%			
F-ratio	59			

Dependent variable: Total quantity of maize produced (Kg), ***, ** and * denote significant level at 1%, 5% and 10% respectively

These findings also concur with the observations made by Minot (2010) and KI (2011) that any additional costs incurred by a trader in the cause of NTBs in most cases, were shifted to farmers in terms of lower prices offered. Moreover, these results carry a policy implication that the implementation of protective food policy strategies such as road blocks and weighbridges in Tanzania would hurt more smallholder farmers especially those who live in the surplus regions such as Songwe. This is because during the study, it was found that farm gate prices in Mbozi District had an average of TZS 250/Kg while the cost of producing a kilogram of maize was TZS 345. Therefore, a farmer has to incur a loss of TZS 95 per kilogram which is equivalent to 16 percent. Similar findings are reported by Gabagambi (2013) who reveal that maize farmers in Kiteto and Kongwa Districts were incurring a loss of TZS 53 per kilogram of maize due to the presence of many NTBs along

the way to the urban markets at Kibaigwa town. This loss was caused by lower producer prices per kilo (TZS 220) which were offered by traders to farmers while the production costs incurred by farmers were TZS 273 per kilo of maize. This situation indicates further that market access by smallholder farmers in Tanzania is still constrained by the cumbersome trade barriers including various types of NTBs such as road blocks, weighbridges, police check points, and customer clearance procedures. These deny farmers access to markets and from securing the right prices for their maize.

In addition, these findings are also in line with those in the descriptive findings of this study in the two districts which show that about 57% of the farmers complained against receiving low prices from local traders. Furthermore, the findings are also consistent with those reported by Haug and Hella (2013) who found that, producer's prices in Sumbawanga and Mbozi were lower when the government banned the export of maize in 2008 and 2011 as compared to that operating before the ban. Likewise, the East African Community (EAC, 2012) reported that maize prices dropped from TZS 45 000 to TZS 30 000 for a bag of 100 kg because of the July 2011 export ban in the major producing regions (Rukwa, Katavi, Ruvuma, Mbeya, Iringa, Njombe and Songwe) in Tanzania.

Findings from this study indicate further that, the quantity of maize produced by farmers seems to increase with the increase of the market prices. The price elasticity coefficient for the market price was valued at 0.699 and significant at 5% implying that a unit increase in the maize prices could raise the supply of maize by 70% *ceteris paribus*. The higher percentage of response to price can be attributed to the fact that price in the spatial farming agriculture is a key motivational factor for farmers' decision on how much amount of maize to produce and supply to the markets. These findings conform to those reported by

Olwande *et al.* (2009); Onono *et al.* (2013) and Haug and Hella (2013) who found similar results in Kenya, Nigeria, and Tanzania respectively.

The land size owned by a farmer was also found to be an important fixed input factor on maize output response in the two districts with elasticity of 0.81 and was significant at one percent (1%). This implies that a unit increase in the size of land allocated on maize production by households could increase its outputs by 81 percent. This is because land as an important factor in crop production, the land size will significantly determine the decision of households to engage in production and supply of produce to the market. These conditions were also revealed by the differences in the quantity of maize outputs produced in Mbozi and Momba Districts whereby farmers who owned more arable land were producing more maize as compared to those with little arable land.

These findings are consistent with those reported by Msuya *et al.* (2008) in Tanzania, who found that land was the most important factor for maize production with the elasticity of 0.6988. This implies that an increase in land under maize production would significantly lead to an increase of maize output by 70 percent. Similarly, Mbise *et al.* (2010) found that the size of land had an influence on bean and maize production in Burundi with the elasticity of 0.33 implying that 10% increase of land size could increase maize and bean production by 3.3 percent. Moreover, studies by Olwande *et al.* (2009) and Onono *et al.* (2013) in Kenya also indicate that allocating more land for maize could raise maize production among small scale farmers in the rural areas. Increased outputs from the allocation of more arable land on maize production could reduce the impacts experienced by farmers from the imposed NTBs (Olwande *et al.*, 2009).

Furthermore, the price of improved seeds has shown a negative influence on maize output with a coefficient of -0.55 and was significant at 10 percent ($P \leq 0.05$). These results imply that a 10 percent increase in the price of improved seeds could reduce maize output by 6 percent, holding other factor constant. Also during the FGD, farmers reported that the prices of improved seeds in the two districts were very high (about TZS 4 000/Kg) to the extent that poor farmers were not able to acquire the seeds and therefore, relied on the seeds selected from their own previous harvests. Moreover, the World Bank (2012) reported that high seeds prices were associated with high costs of seeds production caused by bureaucratic certification and licensing for improved maize seeds by the governments. These observations concur with the findings reported by Aloyce *et al.* (2014) who found that poor farmers were unable and not eligible to receive improved seeds because of lacking top-up funds on the voucher system in Mbozi and Sumbawanga Districts. This situation makes only rich households with more resources to be more eligible of receiving input voucher in the two districts contrary to the targeted group of poor farmers.

In contrast, the quantity of maize produced was found to decrease with an increase in wage rate implying that maize production could decline by 13% with an increase in the level of wages offered at the labour market (Table 16). This is due to the fact that the increased wage rate could reduce the ability of poor farmers to employ more paid labours in the maize production and thus contributing to the reduction of the quantity of maize produced. These findings were in contrast with those reported by Onono *et al.* (2013) who found that in Kenya wage rate was statistically insignificant related to the supply of maize. However, the adverse effect of wage rate on the quantity of maize supplied is less than those of land and seeds implying that maize production responded more on the size of land located for its production. These findings are also in line with the arguments of the theory of rural households under imperfect markets in developing countries which hold that in response to

policy change or market change households can demand more labour at the same time sell its own labour at a given market wage (Taylor and Adelman, 2003). Therefore, the recent inputs subsidy programme is an important program of inducing the supply response in the short run, but its impact would not last long without the reduction of the marketing costs.

In addition, the influence of the change of weather on maize production was captured by the dummy variable of weather such that, 1= good weather, and 0 = poor weather. The results from Table 16 indicate that maize production and supply were positively influenced by the change of weather conditions in the two districts. Maize production and supply could increase more during the good weather by 33 percent. This is because most of the maize production systems in Tanzania are rain-fed. Therefore during the period of high rainfall, farmers produced more maize and therefore supplied more to the markets. This situation could also be reflected in the fluctuation of maize production as presented in Figure 1.

4.5 Summary of Hypotheses Testing

This study tested three hypotheses in relation to NTBs effects on the maize production and marketing in the study area. These hypotheses included the following:

- i. Ho: NTBs costs have no significant influence on of smallholder farmers' decisions to participate in the maize market in Mbozi and Momba Districts.
- ii. Ho: The size of the NTBs effect on the price received by farmers is the same between smallholder farmers in Mbozi and Momba Districts.
- iii. Ho: The implementation of NTBs strategies has no significant effect on the quantity supplied by smallholder farmers in Mbozi and Momba Districts

The first hypothesis was tested using a t-value calculated from the OLS regression estimates as presented in Table 13. The decision rule was that: if the calculated t-value (T_c) is greater than the tabulated one (T_t), reject the null hypothesis ($H_0: \beta_1 = 0$) and does not

reject the alternative hypothesis ($H_a: \beta_1 \neq 0$). The results from Table 13 indicate that the calculated t-value (T_c) in this study for NTBs was 2.46 and the tabulated one (T_t) was 1.645 which is less than the calculated one. Basing on the decision rule explained above, the study has enough evidence to reject its null hypothesis ($H_o: \beta_1 = 0$) and did not reject the alternative hypothesis that ‘‘NTBs has influence on farmers’ decision on market participation and intensity of participating in the markets in the two districts’’.

On the other hand, the second hypothesis was tested using independent sample t-test by comparing the significant differences in NTBs effects between the two districts. The calculated results from the t-test indicate that there was a significant difference in the mean effect of NTBs costs as experienced by farmers between the two districts of Momba and Mbozi. The difference was statistically significant at 0.000 of 2-tailed test with a mean of t-value 4.061. Basing on these results, the study failed to reject its alternative hypothesis which stated that, ‘‘the size of NTBs effect on maize prices received by smallholder farmers varies between Mbozi and Momba districts’’. Therefore, the study had enough evidence to reject the null hypothesis which states that, ‘‘The size of the NTBs effect on price received by farmers is the same between Mbozi and Momba Districts.’’

Furthermore, the third hypothesis was tested using the t-value calculated from the regression equation for estimating the NTBs effects on the quantity of maize produced and supplied by farmers in Table 16. The decision rule was that: if the calculated t-value (T_c) is greater than the tabulated one (T_t), reject the null hypothesis ($H_o: \beta_1 = 0$) and accept the alternative hypothesis ($H_a: \beta_1 \neq 0$). The calculate t-value (T_c) in this study for NTBs was 2.274 and the tabulated one (T_t) was 1.645 which is less than the calculated one. Basing on the decision rule, the study rejected its null hypothesis ($H_o: \beta_1 = 0$) and failed to reject the alternative hypothesis which states that, ‘‘the implementation of NTBs strategies has no

significant effect on the quantity supplied by smallholder farmers in Mbozi and Momba Districts''. In other words, smallholder farmers in Mbozi and Momba Districts were negatively affected by the introduced NTBs on their maize production and marketing.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study aimed at assessing the effect of NTBs on maize production and marketing in the two major maize surplus districts namely Mbozi and Momba located in the Eastern and Western part of Songwe region in Tanzania. Based on the study findings, the following conclusions were made:

The NTBs costs have significant percentage contributions on transaction costs incurred by smallholder farmers in marketing maize in Mbozi and Momba Districts. Farmers in the two districts incurred more NTBs costs in clearing weighbridges followed by police check point and road blocks in that order. Also, the decision of households to enter the maize market (market participation) in the two districts was negatively influenced by NTBs costs and distance to the market. This implies that an increase in the costs attributed to NTBs could lead to the decline in maize production and access to markets by smallholder farmers.

On the other hand, an increase in NTBs costs and distance to the market were found to reduce the ability and willingness (market intensity) of farmers to participate in the markets in terms of quantity of maize sold in the two districts. In contrast, the likelihood of smallholder farmers to participate in the market was enhanced through an increase in the education level of the household, quantity of maize produced, and the number of livestock owned by the household, market price, and market experience by the household head.

The price received by smallholder farmers in the two districts was found to decrease with an increase in the cost of NTBs and distance to the urban markets where prices were lower

in Mbozi District than was the case with those in Momba District. Furthermore, the results from t-test showed that there was a statistical significant (at the 5 % level) difference between the mean effects of NTBs on price received by farmers between the two districts (Mbozi and Momba).

In addition, the quantity of maize produced and supplied by farmers in Mbozi and Momba Districts were found to decrease with an increase of the NTBs costs and the prices of improved seeds and labour. In contrast, the size of land owned by households, market prices, and family size were found to positively influence the production and supply of maize in the two districts. This implies that among other things, land and market price were the important determinants for increased production and marketing of maize in Mbozi and Momba Districts.

5.2 Recommendations

To improve production and market participation for maize smallholder farmers especially in the rural area based on the findings from this study, the following recommendations are suggested:

To improve maize production and marketing among farmers in Mbozi and Momba, the implementation of policies that emphasize the reduction of transaction costs as attributed to NTBs and long distance to the markets should be enhanced. This could be done through the establishment of Time-Bound programme which will involve both private and public sectors for eliminating or reducing the number of unnecessary NTBs on food crop trade such as weighbridges, road blocks, and council permits at the district and region levels.

Also, the LGAs has to allocate more funds on the improvement of rural roads which link rural farmers to the district markets which in one way or another could contribute in

reducing market transaction costs. The decrease in transaction costs will increase the farm-gate prices offered by traders and thus motivate farmers to produce more maize and participate actively in the market.

To increase market accessibility for smallholder farmers and policies that encourage access to market information should be enhanced. This also could be done through the establishment of market information centres and employment of more agricultural extension workers which will facilitate the dissemination of information related to maize markets.

Likewise, the introduction of agricultural programs on radio and television will significantly increase the awareness of farmers and thus enhance their decisions to enter the maize market. This, in the long run, could contribute much to the increased maize production and prices which in turn have an implication on the country food security status given that maize is the country's staple food crop.

To improve farm-gate prices received by smallholder farmers, implementation of contract farming system on marketing of maize will help to hedge against low prices experienced by farmers just after bumper harvests. Also, a proper liberalization on the NFRA purchasing system enforced by information symmetric among farmers and traders is recommended whereby maize prices will be determined by the market forces (demand and supply). This will create competitive environments which could give farmers more alternative places of selling their maize. This would be contrary to the current system where the price is fixed above the market price (floor price), which in most cases encourage private traders to buy maize from farmers at low price and then sell it to NFRA at higher prices.

In addition, to increase production and supply of maize among farmers in the two districts, more subsidization on the necessary inputs such as fertilizers, improved seeds, and pesticides is recommended. This could be achieved by the government using the Ministry of Agriculture through setting up low prices and bulk purchase of fertilizers and improved seeds to poor rural farm households. This would enable the majority of farmers in the rural areas who are constrained with shortage of funds to purchase more inputs and therefore use the right quantity of fertilizers on a particular land size which could lead to increased maize productivity and production.

Generally, policies which are aimed at lowering transaction costs would help in promoting maize production and hence agricultural growth as well as in the reduction of poverty among rural households in the country.

5.3 Contribution of the Research

The contribution of this study to body of knowledge and methodology are presented under the following headings.

i. To the body of knowledge

According to the reviewed literatures, it was revealed that most of the previous studies on NTBs effects were centered on the cross border trade and welfare effects and ignored their effects on price and production especially at the farm level. Thus, unlike the previous studies discussed in this thesis, this study has gone a one step further and estimated the effect of NTBs strategies on farmers' production and their decisions to participate in the maize markets in Tanzania. The study findings indicate that NTBs negatively influence the price, production, and supply of maize among farmers. Therefore, the study had managed to

link the effects of NTBs to farmers' production and marketing and thus contributing to the general knowledge of understanding the effects of NTBs.

Furthermore, the study also presented its findings at two international conferences which were organized by international organizations in the United Arab Emirate - Dubai and Zurich in Switzerland for the year 2014 and 2015 respectively. Moreover, the improved proceeding papers from the two conferences were organized and published on the reputable international journals for further dissemination of knowledge on NTBs relationship with maize production and marketing under farm households' perspective. These journals included the Journal of Development and Agricultural Economics (JDAE). (<http://www.academicjournals.org/JDAE>) and the Journal of International Review of Research in Emerging Markets and the Global Economy (<http://www.Globalbizresearch.org>).

ii. Methodological contributions

The agricultural household model has been commonly used in most of the studies related to transactions costs as a suitable model for capturing the duality nature of households' decisions in the LDCs. However, it has paid little attention on the influence of costs attributed to NTBs strategies, thus in this study NTBs costs were considered as an extra cost above the common transaction costs which farmers and traders had to incur and were included in the agricultural household model as explanatory variable. This enabled the study to provide the right contribution of NTBs on the market transaction costs and participation above the common transaction costs.

Moreover, the study has used the duality model to derive the supply function indirectly from profit function using only cross sectional data which have given the similar outputs as

those coming from the normal production function. This approach has improved the production function which is used in measuring the supply responses in the absence of time series data as opposed to what was proposed in the Nerlove model in 1958 which emphasis the use of a lagged price value.

5.4 Areas for Further Research

Based on the findings from this study, the recommended areas for further research are areas as follows.

This study used cross-sectional data to estimate the effects of NTBs on market participation; therefore it is recommended that future studies should consider using time series data so as to capture how sequential change in households' socio-economic characteristics and NTBs influence the market participation. This is because recently, there has been the growing concern that to appropriately determine the factors that influence market participation or commercialization, there is a need of using time series data.

Also, this study was conducted on the surplus areas which are located close to the country's borders; this means that some inferences which were made in this study may not apply suitably to the surplus and deficit areas which are located at the centre of the country or far from the borders. Therefore, the study recommends that future studies should consider using such areas in estimating the effects of NTBs on price and production. This would help the government in formulating policies whose goals include creating high prices in the surplus districts and low consumer prices in the deficit urban centres.

Furthermore, future studies should focus on how socio-cultural behaviour of traders and transporters could influence the contribution of NTBs on the transaction costs and market costs on maize trade and speculative storage in Tanzania.

REFERENCES

- Abidoye, B. O. and Labuschagne, M. (2012). *The Transmission of World Maize Price to South African Maize Market: A Threshold Co integration Approach*. University of Pretoria Press, South Africa. 29pp.
- Agricultural Council of Tanzania (ACT) (2010). *Report of agriculture sector stakeholders meeting on investment incentives held at Blue Pearl Hotel, July 2010, Dar es Salaam, Tanzania*. 26pp.
- Aloyce, G. M., Gabagambi, D. M. and Hella, J. P. (2014). National Agriculture input Voucher scheme impact on Productivity and Food security of smallholder farmers in Tanzania. *Journal of Economics and Sustainable Development* 5(21): 32– 43.
- American Marketing Association (2008). Definition of marketing. [<http://www.marketingpower.com/aboutAMA/pages/definitionofmarketing.aspx-American>] site visited on 23/02/2016.
- Ancharaz, V., Ghisu, P. and Frank, N. (2014). *Tanzania: Deepening Engagement with India through Better Market Access*. Issue Paper No. 32. International Centre for Trade and Sustainable Development, Geneva, Switzerland. 59pp.
- Anderson, K., Ivanic, M. and Martin, W. (2013). *Food Price Spikes, Price Insulation, and Poverty*. Discussion Paper No. 9555. CEPR, USA. 10pp.

- Ardakani, Z., Yazdani, S. and Gilanpour, O. (2009). Studying the effects of non-tariff barriers on the export of the main agricultural products of Iran. *American Journal of Applied Sciences* 6(7): 1321 – 1326.
- Arega, D. A., Manyong, V. M., Omany, G., Mignouna, H. D., Bokanga, M. and Odhiambo, G. D. (2007). Smallholder marketed surplus and input use under transactions costs: maize supply and fertilizer demand in Kenya; *AAAE Ghana Conference Proceedings* Ghana. 125 – 130pp.
- ASARECA (2009). Impact of Non-Tariff Barriers on Maize and Beef Cattle Cross border Trade in Eastern Africa, *PAAP's Newsletter* 12: 1 – 9.
- Baffes, J., Kshirsagar, V. and Mitchell, D. (2015). *Domestic and External Drivers of Maize Prices in Tanzania*. Ghana. 14pp.
- Baldwin, R. (1970). *Non-Tariff Distortions in International Trade*. Brookings Institution, Washington DC, USA. 360pp.
- Barrett, C. (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy* 33(4): 299 – 317.
- Barrett, C. B. (2007). Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. *FAO workshop on Staple Food Trade and Market Policy Options for Promoting Development in Eastern and Southern Africa*, Rome, March 1-2, 2007.

- Beattie, B. R. and Taylor, C. B. (1985). *The Economics of Production*. Krieger Publishing Company MALABAR, Florida, USA. 165pp.
- Beghin, J. and Bureau, J. C. (2001). Quantitative policy analysis of sanitary, phytosanitary and technical barriers to trade. *Économie Internationale* 87: 107 – 130.
- Benham, A. and Benham, I. (2010). The cost of exchange: In: *The Elgar Companion to Transaction Cost Economics*. (Edited by Klein, P. G. and Sykula, M. E.), Edward Elgar Publishers, USA. pp. 1 – 17.
- Bisanda, S., Mwangi, W., Verkujil, H., Moshi, A. J. and Anandajayasekeram, P. (1998). *Adoption of Maize Production Technologies in the Southern Highlands of Tanzania*. International Maize and Wheat Improvement Center, Mexico. 30pp.
- Blaylock, J. R. and Blisard, W. N. (1993). Women and the demand for alcohol: estimating participation and consumption. *Journal of Consumer Affairs* 27(2): 319-324.
- Bliss, J. and Stern, H. (1982). *Palanpur: The Economy of an Indian Village*. Delhi and New York: Oxford University Press. 415pp.
- Bora, B. Kuwahara, A. and Laird, S. (2002). *Quantification of Non-Tariff Measures, Policy Issues in International Trade and Commodities*. Study Series No. 18. United Nations Conference for Trade and Development, USA. 22pp.
- Boughton, D., Mather, D., Barrett, C. B., Benfica, R., Danilo, A., Tschirley, D. and Cunguara, B. (2007). *Market Participation by Rural Households in a Low-*

Income Country: An Asset-Based Approach Applied To Mozambique.
Agriculture Hall, Michigan State Universities, USA. 42pp.

Business Monitor International (2016). *Tanzania Agribusiness Report Q3 2016*. BMI research, London United Kingdom. pp 71.

Bwalya, R., Mugisha, J. and Hyuha, J. (2013). Transaction Costs and Smallholder household access to Maize markets in Zambia. *Journal of Development and Agricultural Economics* 8: 328– 336.

Calander, D. C. (2004). *Macroeconomics*. MC Graw Hill, New York, USA. 340pp.

Chayanov, A. V. (1966). *The Theory of Peasant Economy*. The American Economic Association, USA. 260pp.

Coase, R. H. (1937). The Nature of the Firm. *Journal of Economics* 4: 386 – 405.

Coulson, A. (2010). Kilimo Kwanza: A new start for agriculture in Tanzania?
[www.btsociety.org/app/images/events/kilimo_kwanza_paper.pdf] site visited on 12/10/2015.

Creswell, J. W., Hanson, W. E., Plano, V. L. C. and Morales, A. (2007). Qualitative research designs: selection and implementation. *The Counseling Psychology* 35(2): 236-264.

De Janvry, A. and Sadoulet, E. (2010). Agriculture for development in Sub-Saharan Africa: An Update. *African Journal of Agriculture and Resource Economics* Vol 5 No. 1 September 2010.

de Janvry, A., Fafchamps, M. and Sadoulet, E. (1991). Peasant household behavior with missing markets: Some paradoxes explained. *Economic Journal* 101: 1400 – 1417.

Dean, J., Ferberg, R., Signoret, J., Ferantino, M. and Ludema, R. (2008). *Estimating the Price affects of Non Tariffs Barriers*. Working Paper No. 06. International Trade Commission, USA. 40pp.

Deardorff, A. V. and Stern, R. (1997). *Measurement of Non-tariff Barriers*. Economics Department Working Papers No. 179. Organization for Economic Cooperation and Development. USA. 36pp.

Deb, U. K. (2006). *Rules of Origin and Non-Tariff Barriers in Agricultural Trade: Perspectives from Bangladesh and Cambodia*. Asia-Pacific Research and Training Network on Trade initiative, Canada. 30pp.

Deb, U., Chandra Das, N., Khaled, N. and Rabbani, N. (2005). *Non-Tariff Barriers in Agricultural Trade: Perspectives from Bangladesh and Cambodia*. World Trade Organization. Geneva, Switzerland. 26pp.

Delgado, C. and Nicholson, C. (1997). Smallholder dairying under transactions costs in East Africa. *World Development* 25: 779–794.

- Delgado, C., Minot, N. and Tiongco, M. (2005). Evidence and implications of non-tradability in food staples in Tanzania. *Journal of Development Studies* 41(3): 376 – 393.
- Demeke, L. B. and Haji, J. (2014). Econometric analysis of factors affecting market participation of smallholder farming in Central Ethiopia. *Journal of Agricultural Economics, Extension and Rural Development* 2(6): 094-104.
- Diao, X., Kennedy, A., Mabiso, A. and Pradesha, A. (2013). *Economy Wide Impact of Maize Export Bans on Agricultural Growth and Household Welfare in Tanzania: A Dynamic Computable General Equilibrium Model Analysis*. International Food Policy Research Institute, USA. 49pp.
- Dixie, G. (1989). *Horticultural Marketing In: A Resource and Training Manual for Extension Officers*. Food and Agriculture Organization, Rome, Italy. 10pp.
- East African Community (2012). Impact of export ban on Maize trade. [http://www.pma.go.ug/docs/Analysis%20for%20Tanzania%20Maize%20Export%20Ban_%20January%202012] site visited on 15/10/2014.
- FAO (1995). Economic and social Research in Sugar cane production. In: *Proceedings of Pacific Sugar Conference* held on 29 – 31 October 1997, Fiji, Asia. pp. 7 – 29.
- FAO (2009). *Crop Prospect and Food situation; Global Cereal Supply and Demand Brief*. Food and Agriculture Organization, Rome, Italy. 140pp.

FAO (2012). *Analysis of Incentives and Disincentives for Maize in the United Republic of Tanzania*. Food and Agriculture Organization, Rome, Italy. 220pp.

FAO (2013). *Review of Food and Agricultural Policies in the United Republic of Tanzania*. Food and Agriculture Organization, Rome, Italy. 137pp.

FAO (2016). Smallholder productivity under climatic variability: Adoption and impact of widely promoted agricultural practices in Tanzania, by Aslihan Arslan, Federico Belotti and Leslie Lipper. ESA Working Paper No. 16- 03. Rome, Italy.

Ferrantino, M. (2006). Quantifying the trade and economic effects of non-tariff measures. OECD Trade Policy Working Papers No. 28. OECD publishing. 26pp.

FEWSNET (2012). *Monitors Trends on Staple Food Prices in Countries Vulnerable to Food Insecurity*. Price Watch Food Prices. USAID, Washington, USA. 34pp.

Fugazza, M. (2013). *The Economics behind Non-Tariff Measures: Theoretical Insights and Empirical Evidence*. Study Series No. 57, United Nations Conference on Trade and Development (UNCTED), Geneva, Switzerland. 33pp.

Fugazza, M. and Maur, J. C. (2006). Non-Tariff barriers in CGE models: how useful for policy? *Journal of Policy Modeling* 30: 475–490.

- Furubotn, E. G. and Richter, R. (2005). *Institution and Economic Theory; The Contribution of the New Institution Economics*. The University of Michigan Press, USA. 13pp.
- Friedrich T, Kassam A (2016). Food security as a function of Sustainable Intensification of Crop Production. *AIMS Agriculture and Food*, 1(2):227-238
DOI:10.3934/agrfood.2016.2.227.
- Gabagambi, D. (2013). Barriers to Trade for Smallholder farmers in Tanzania: *A Review and Analysis of Agricultural Related Market Policies in Tanzania*. Eastern and Southern African small scale Farmers Forum, Dar es Salaam, Tanzania. 40pp.
- Gabriel, A. H. (2000). *The Supply Responsiveness of Peasant Agriculture in Ethiopia: Some Macro Econometric Results from Cereals Production*. Ethiopian Civil Service College Staff, Ethiopia. 27pp.
- Gilson, I. and Charalambides, N. (2011). *Addressing Non-Tariff Barriers on Regional Trade in Southern Africa: A Fresh Look at Trade Policy's New Frontier*. World Bank, Washington DC. USA. 45pp.
- Govere, J. and Jayne, A. J. (1999). *Effects of Cash Crops Production on Food Crop Productivity in Zimbabwe: Synergies or Trade-Off?* Working Paper No.74. Michigan State University, USA. 16pp.
- Greene, W. H. (2003). *Econometric Analysis*, Fifth edition. Pearson Education, Inc., Upper Saddle River, New Jersey, 07458. USA.

- Gujarati, N. D. (2004). *Basic Econometrics*. McGraw-Hill Companies, Inc., New York, USA. 577pp.
- Haug, R. and Hella, P. J. (2013). The art of balancing food Security: Securing availability and affordability of Food in Tanzania. *International Society for Plant Pathology Journal* 5: 1 – 11.
- Heckman, J. J. (1979). Sample selection bias as a specification error, *Econometrical* 47: 153-161.
- Hella, J. P., Haug, R. and Kamile, I. (2011). High global food prices—crisis or opportunity for smallholder farmers in Tanzania? *Development in Practice* 21(5): 652 – 665.
- Holloway, G., Nicholson, C., Delgado, C., Staal, S. and Ehui, S. (2000). Agro-industrialization through institutional innovation: transactions costs, cooperatives and milk-market development in the east-African Highlands. *Journal of Agriculture Economics* 23: 279–288.
- IFPRI (2012). *Economy wide Impact of Maize Export Bans on Agricultural Growth and Household Welfare in Tanzania: Discussion Paper 01287*. International Food Policy Research Institute, Washington DC. USA. 112pp.
- Ihle, R. and von Cramon-Taubadel, S. (2010). Semi- parametric evidence on the nature of price transmission in Tanzanian maize markets. *Paper presented at the Agricultural and Applied Economics Association Joint Annual Meeting, Denver, Colorado, 25 – 27 July, 2010. pp. 1 – 36.*

Indeximundi (2015). Statistics on staple food production in Africa. [www.indeximundi.com] site visited on 15/10/2015.

Ismail, I. J. (2014). Influence of Market Facilities on Market Participation of Maize Smallholder Farmer in farmer organization's market services in Tanzania: Evidence from Kibaigwa International Grain Market. *Global Journal of Biology, Agriculture and Health Sciences* 3(3): 181 – 189.

Jagwe, N. (2011). *The Impact of Transaction Costs on the Participation of Smallholder Farmers and Intermediaries in the Banana Markets of Burundi, Democratic Republic of Congo and Rwanda*. Department of Agricultural Economics, Extension and Rural Development faculty of Natural and Agricultural Sciences, University of Pretoria.

Jaleta, M., Gebremedhin, B. and Hoekstra, D. (2009). *Smallholder Commercialization: Processes, Determinants and Impact*. Discussion Paper No. 18. International Livestock Research Institute, Nairobi, Kenya. 28pp.

Karfakis, P. and Rapsomanikis, G. (2008). *Margins across Time and Space: Threshold Co Integration and Spatial Pricing Applications to Commodity Markets in Tanzania*. Working Paper No. 00153. Food and Agricultural Organization, Rome, Italy. 27pp.

Karugia, J., Wanjiku, J., Njuma, J., Freeman, A., Gbegbelegbe, S., Macharia, E. and Massawe, S. (2009). *Impact of Non Tariffs Barriers on Maize and Beef Trade in East Africa*. Working Paper No. 29. International Food Policy Research Institute, Washington DC. USA. 16pp.

- Key, N., Sadoule, E. and de Janvry, A. (2000). Transactions costs and agricultural household supply response. *American Journal of Agricultural Economics* 82: 245 – 259.
- KI (2011). *The Impact of Domestic and Cross Border Trade Restriction in Tanzania*: Rural Livelihood Development Company, Dodoma, Tanzania. 76pp.
- Kilima, F. T., Kenkel, P. and Mbiha, E. (2008). Impacts of market reform on spatial volatility of maize prices in Tanzania. *Journal of Agricultural Economics* 59(2): 257 – 270.
- Kissel, R. (2006). The expanded implementation shortfall: Understanding transaction costs components. *Journal of Trading Summer* 24(2): 250 – 261.
- Kohls, R. L. and Uhls, J. N. (1990). *Marketing of Agricultural Products*. MicMillian Publishing Company, New York USA. 173pp.
- Komarek, A. (2010). The determinants of banana market commercialization in Western Uganda. *African Journal of Agricultural Research* 5(9): 775-784.
- Kothari, C. R. (2009). *Research Methodology: Methods and Techniques*. 2nd Edition. New Age International (P) LTD Publishers. New Delhi, INDIA. 401pp.
- Kweka, J. (2006). *Trade Policy and Transport Costs in Tanzania*. Research Paper No. 10. Centre for Research in Economic Development and International Trade, University of Nottingham, UK. 33pp.

- Kydd, J., Dorward, A., Morrison, J. and Cadisch, G. (2004). Agricultural development and pro-poor economic growth in Sub-Saharan Africa: Potential and Policy. *Oxford Development Studies* 32: 37 – 57.
- Larson, D. F. and Leo'n, M. (2006). How Endowments, Accumulations, and Choice determine the Geography of agricultural productivity in Ecuador. *The World Bank Economic Review* 20(3): 449 – 4471.
- Lubungu, M., Chapota, A. and Tembo, G. (2012). Smallholder farmers' participation in livestock Markets: Case study of Zambia. Indaba for Agriculture Policy Research Institute. Working Paper No. 66.
- Magrinia, E., Montalban, P., Nencid. S. and Salvaticid, L. (2014). *Agricultural Trade Policies and Food Security: Is there a Causal Relationship?* Food and Agriculture Organization, Rome, Italy. 52pp.
- Makhura, M. T. (2001). Overcoming transaction costs barriers to market participation of smallholder farmers in the Northern Province of South Africa. Thesis for Award of PhD Degree at University of Pretoria, South Africa. 328pp.
- Makhura, M., Kirsten, J. and Delgado, C. (2001). Transaction costs and smallholder participation in the maize market in Northern Province of South Africa. *Seventh Eastern and Southern Africa Regional Maize Conference*, 11 – 15 February 2001. pp. 463 – 467.

- Makindara, J. R. (2012). Sorghum Value Chain Analysis in Tanzania: Case study of Production and Marketing potential for sorghum based clear Beer. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 226pp.
- Mamuya, B. W. (2011). Assessing the impacts of organic farming on domestic and exporting smallholder farming households in Tanzania. Thesis for Award of PhD Degree at Bangor University, Bangor, United Kingdom. 280pp.
- Maro, F. and Mwaijande, F. (2014). Food Price Trend Analysis: Lessons for strengthening food security policy in Tanzania. *African Crop Science Journal* 22: 929 – 939.
- Match Maker Associates (2010). *Value Chain Analysis for Rice and Maize in Selected Districts in Tanzania: Introduction, Context Analysis and Recommended Way Forward*. Agricultural Council of Tanzania, Dar es Salaam, Tanzania. 89pp.
- Mbise, M., Ngongola, D. H., Chale, H., Maonga, B. and Kilima, F. T. M. (2010). Transaction costs and food security: A case of maize in southern highlands of Tanzania Regional *Universities Forum for Capacity Building in Agriculture: Paper Presented at the Second RUFORUM Biennial Meeting 20 - 24 September 2010, Entebbe, Uganda*. pp. 1 – 18.
- McFadden, D. (1978). Cost, Revenue and Profit Function. *A Dual Approach to Theory and Application* 1: 93 – 109.

- Mduma, J. K. (2003). *Village Level Analysis of the Factors Affecting Households' Participation in Rural Labor Markets in Tanzania*. Policy Analysis for Sustainable Agricultural Development in Central and Eastern Europe and Southern Africa, South Africa. 25pp.
- Mendola, M. (2005). Farm Households Production Theories: A Review of Institutional and Behavioural Responses. EL Classification: D13, Q12, O13.
- Mendola, M. (2007). Farm Household Production Theories: A Review of Institutional and Behavioral Responses. *Asian Development Review* 24(1): 49-68.
- Meyer, F., Westhoff, P., Binfield, J. and Kirsten, J. K. (2006). Model closure and price formations under switching market regimes. *Agrekon* 45(4): 370 – 380.
- Minot, N. (2010). *Transmission of World Food Price Change to African Markets and Its Effects on Households Welfare*. International Food Policy Research Institute Washington DC, USA. 27pp.
- Minot, N. (2014). Food price volatility in sub-Saharan Africa: Has it really increased? *Food Policy* 45: 45 – 56.
- Minot, N., Epprecht, M., Anh, T. T. and Le, Q. (2006). *Income Diversification and Poverty in the Northern Uplands of Vietnam*. Research Report No. 145. International Food Policy Research Institute Washington DC, USA. 30pp.

- Mkenda, B. K. and Van Campenhout, B. (2011). *Estimating Transaction Costs in Tanzanian Supply Chains*. Working Paper No. 898. International Growth Centre Tanzania, Dar es Salaam, Tanzania. 48pp.
- Moctar, N., d'Hôtel Elodie, M. and Tristan, L. (2015). *Maize Price Volatility: Does Market Remoteness Matter?* World Bank Group. Policy Research Working Paper No. 7202. Washington DC. USA. 33pp.
- Mold, A. (2005). *Non-Tariff Barriers; Their Prevalence and Relevance for Africa*, Economic Commission on for Africa: Paper No. 25. African Trade Policy Centre, USA. 25pp.
- Moser, C., Barrett, C. and Minten, B. (2009). Spatial integration at multiple scales: Rice markets in Madagascar. *Journal of Agricultural Economics* 40: 281–294.
- Movchan, V. and Eremenko, I. (2003). Measurement of Non-Tariff Barriers: The Case of Ukraine. In: *Proceeding for the Fifth Annual Conference of the European Trade Study Group* 11-13 September, 2003, Madrid, Spain. 26pp.
- Msuya, A. (2011). Produce Cess: A Stumbling Block to Agricultural Revolution in Tanzania, a Policy brief, Agriculture Council of Tanzania (ACT), Dar es Salaam, Tanzania. 04pp.
- Msuya, E., Hisano, S. and Nariu, T. (2008). Explaining Productivity Variation among Smallholder Maize Farmers in Tanzania. In: *Proceeding of the XII World Congress of Rural Sociology of the International Rural Sociology Association*, Goyang, Korea. pp. 1 – 32.

- Musah, A. B., Bonsu, O. and Sein, W. (2014). Market Participation of Smallholder maize farmers in the Upper west Region of Ghana. *African Journal of agricultural Research* 9 (31): 2427 – 2435.
- Musumba, M. and Costa, R. M. (2015). Impacts of marketing costs on supply chains in Tanzania: *Paper Presented at the Agricultural and Applied Economics Association's 2015 AAEA and WAEA Joint Annual Meeting, San Francisco 26-28 July, 2015.* pp. 1 – 7.
- Nakra, P. (2006). Beware of non-tariff barriers in global markets. *Paper Presented At The International Conference On Trade Restrictions in Africa 28 – 30 August 2006, Kampala Uganda.* pp. 1 – 22.
- Namwata, B. M. L., Kikula, I. S. and Kopoka, P. A. (2015). Access of urban farmers to land, water and inputs for urban agriculture in Dodoma municipality, Tanzania. *Journal of African Studies and Development* 7(1): 31 - 40.
- National Bureau of Statistics of Tanzania (2008). *National Sample Census of Agriculture Report.* National Bureau of Statistics, Dar es Salaam, Tanzania. 29pp.
- National Bureau of Statistics of Tanzania (2014). Population statistics in maps and charts for the regions, districts, wards, cities and urban localities in Tanzania. [www.citypopulation.de/Tanzania.html] site visited on 6/3/2016.
- National Bureau of Statistics of Tanzania (2014). *Tanzania National Panel Survey Report* National Bureau of Statistics, Dar es Salaam, Tanzania. 109pp.

- Nganga, T. K. (2014). *Barriers to Trade: The Case of Kenya*. World Trade Organisation, Geneva, Switzerland. 71pp.
- Nkang, M., Udom, D. and Abang, S. (2006). Staple food policy and supply response in Nageria: A case of Cassava. *Journal of Food, Agriculture and Environment* 4(2): 143 – 146.
- Nwanze, O. (2000). *Monitoring Rural Well-being: A rural Score Card*. International Bank for Reconstruction and Development, Washington DC. USA. 15pp.
- Odulaja, A. and Kiros, F. G. (1996). Modeling agricultural production of small-scale farmers in sub-Saharan Africa: A Case Study in Western Kenya. *Agricultural Economics* 14: 85 – 91.
- Ohajianya, D. and Ugochukwu, A. (2011). An ordered probit model analysis of transaction costs and market participation by sweet potato farmers in South Eastern Nigeria: *Paper presented at 85th Annual Conference of the Agricultural Economics Society*, Warwick University, Canada. 18 - 20 April, 2011. pp. 1 – 12.
- Okumu, L. and Nyankori, J. C. (2010). *Non-Tariff Barriers in EAC Customs Union: Implications for Trade between Uganda and other EAC Countries*. *Economic Policy Research Centre*. International Food Policy Research Institute, Washington DC. USA. 51pp.

- Olwande, J. and Mathenge, M. (2012). Market participation among poor rural households in Kenya. *The International Association of Agricultural Economists (IAAE) Triennial Conference*, Fozdo Iguaçu, 18 – 24 August 2012. pp. 1 – 17.
- Omiti, J. M., Otieno, D. J., Nyanamba, T. and McCullough, E. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics* 3(1): 57-82.
- Onono, P. A., Wawire, N. W. H. and Ombuki, C. (2013). The response of maize production in Kenya to economic incentives. *International Journal of Development and Sustainability* 2(2): 530 – 543.
- Osebeyo, S. O. and Aye, G. C. (2014). Transaction costs and marketing decision: a case study of smallholder tomato farmers in Makurdi, Nigeria. *Journal of Urban, Planning and Transport Research* 2(1): 333 – 340.
- Pender, J. and Gebremedhin, B. (2007). Determinants of Agricultural and Land Management Practices and Impacts on Crop Production and Households income in Highlands of Tigray, Ethiopia. *Journal of African Economies* 17(3): 395 – 450.
- Poopakdi, A. (1991). Sustainable small scale farmers: A farming system perspective. [<http://www.agnet.org/holmlares.file/library/bc44002.pdf>] site visited on 28-02-2016.

- Porteous, O. (2012). *Empirical Effects of Short-Term Export Bans: The Case of African Maize*. University of California, USA. 27pp.
- Pravakar, S., Castellanos, I. V. and Rahut, D. B. (2010). *Commercialization of Agriculture in the Himalayas*. Discussion Paper No. 265. IDE, USA. 18pp.
- Randela, R., Alemu, Z. G. and Groenewald, J. A. (2008). Factors enhancing market participation by small-scale cotton farmers. *Agrekon Journal* 47(4): 451 – 457.
- Rasmussen, J. (2009). *The International Food Crisis -Catastrophe or Historic Opportunity for Africa? The case of Tanzanian maize*: Roskilde University, 17pp.
- Ricker-Gilbert, J. and Jayne, T. S. (2009). *Do Fertilizer Subsidies Affect the Demand for Commercial Fertilizer? An Example from Malawi*. International Association of Agricultural Economists, Beijing, China. 26pp.
- Samuelson, P. and Nordhaus W. (2005). *Economics*. Tata Mc-Graw-Hill: New Delhi. 776pp.
- Saunders, M., Lewis, P. and Thornhill, A. (2007). *Research Methodology for Business Students*. Prentice Hall, Madrid Spain. 504pp.
- Sebatta, C., Mugisha, J., Katungi, E. and Kasharu, A. (2012). Determinants of smallholder farmers' participation in the potato market in Kabale and Mbale. College of Agricultural and Environmental Sciences, Department of Agribusiness and Natural Resource Economics, Makerere University, Kampala, Uganda. 38pp.

- Sebatta, C., Mugisha, J., Katungi, E., Kashaaru, A. and Kyomugisha, H. (2014). Smallholder farmers' decision and level of participation in the potato market in Uganda. *Modern Economy* 5: 895 – 906.
- Sekaran, U. (2003). *Research Methods for Business: A Skill Building Approach 4th ed.* John Wiley and Sons Inc, New York. 295pp.
- Sharma, R. (2010). *Tanzania-Agricultural Trade Policy Issues*. Food and Agriculture Organization, Rome, Italy. 317pp.
- Singh, I., Squire, L. and Strauss, J. (eds.) (1986). *Agricultural Household Models- Extensions, Applications and Policy*. The Johns Hopkins University Press, Baltimore. 2: 21 – 43.
- Sitko N. J., Kuteya, A. N. and Chisanga, B. (2014). Analysis of the Effects of Maize Trade Restrictions in the COMESA Region on Food Prices and Market Development. In: *Proceeding of COMESA and ACTESA Workshop: Indaba Agricultural Policy Research Institute*, Lusaka, Zambia. pp. 1 – 24.
- Siziba, S., Nyikahadzoi, K., Diagne, A, Fatunbi, A. O. and Adekunle, A. A. (2010). Determinants of cereal market participation by Sub-Saharan Africa smallholder farmer. *Learning Publics Journal of Agriculture and Environmental Studies* 2: 180-193.

South Africa Rural Development Framework (1997). Definition of rural area. [<http://www.Cbdd.wsu.edu/kewlcontent/cdoutput/TR501/page59.htm>] site visited on 5/2/2016.

Southern African Development Community (2006), Towards a Common Market in Africa. [<http://www.sadc.int/fta/>] site visited on 14/2/2016.

Strauss, J. (1986). *The Theory and Comparative Statics of Agricultural Household Models: A General Approach*. The Johns Hopkins University Press. London. 91pp.

Taylor, J. and Adelman, I. (2003). Agricultural household models: genesis, evolution and extensions. *Review of Economics of the Household* 1: 45.

Temu, A. E. and Temu, A. G. (2005). High value agricultural products for smallholder markets in Sub-Saharan Africa trends, opportunities and research priorities; an *International Workshop on How Can Poor Benefit From the Growing Markets for High Value Agricultural Products? International Centre for Tropical Agriculture*. Colombia. 3-5 October 2005. pp. 1 – 25.

Towo, E. N. (2012). Rural Small Scale farmers' access to credit in Iringa and Kilimanjaro regions, Tanzania. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 195pp.

UNESCO-Tanzania (2011). *Agricultural Green Revolution to Improve Agriculture Productivity in Tanzania*. United Nations, Education, Scientific and Cultural Organisation, Mexico. 47pp.

United Republic of Tanzania (2013). *National Agriculture Policy*. Ministry of Agriculture, Food Security and Cooperative, Dar es Salaam, Tanzania. 341pp.

United Republic of Tanzania (2001). *Basic Data on Agriculture Sector 1999/2000*. Ministry of Agriculture, Food Security and Cooperative, Dar es Salaam, Tanzania. 57pp.

Urrasa, H. (2010). Rural Households Livelihoods, Crop Production and well-Being After a Period of Trade Reforms: A case study of Rukwa region in Tanzania. Thesis for Award of PhD Degree at University of Life Science of Belgium, Belgium, 232pp.

USAID (2010). *Staple Foods Value Chain Analysis. Country Report Tanzania*. United States Agency for International Development, Washington. DC. USA. 130pp.

USAID (2012). East African Corn Report: *Journal of Agricultural Economics* 31: 20 – 32.

USAID Tanzania (2005). *Measuring Rurality: What is Rural? Economic Research Services*. USDA, USA. 12pp.

Van Campenhout, B. (2007). Modeling trends in food market integration: Method and an application to Tanzanian maize markets. *Journal of Food Policy* 32: 112–127.

Von Braun, J. (2005). Small scale farmers in Liberalized trade environment. In: *Proceedings on the Seminar on October, 2004*. Hoikoko, Finland. 230pp.

- Wall, C. A. and Fisher, B. S. (1988). Supply response and the theory of production and Profit Functions. *Review of Marketing and Agricultural Economics* 56(2): 383 – 404.
- Warr, P. and Kohpaiboon, A. (2007). *Distortions to Agricultural Incentives in a Food Exporting Country: A cas of Thailand*, Research Gate publication, World Bank, Washington, DC. pp70.
- WEMA (2010). *Mitigating the Impact of Drought in Tanzania: The WEMA intervention* Policy Brief November 2010. 32pp.
- World Bank (2008). *Regional Trade in Food Staples: Prospects for Stimulating Agricultural Growth and Moderating Short-Term Food Security Crises in Eastern and Southern Africa*. Report no. 46929. America Food Research, Washington DC. USA. 234pp.
- World Bank (2009). *World Development Report: Agriculture for Development*. The World Bank. Washington DC. USA. 24pp.
- World Bank (2012). *Africa Can Help to Feed Africa: Removing Barriers to Regional Trade in Food Staples*. Africa Food Report No. 66500. Poverty Reduction and Economic Management Africa Region. 87pp.

APPENDICES

Appendix 1: Questionnaires used for smallholder farmers

Introduction

My name is.....from Sokoine University of Agriculture, Morogoro, Tanzania. This interview is a part of the study on the **“Effects of Non-Tariff Barriers on Maize Production and Marketing in Songwe Region of Tanzania”**. I would like to ask you some few questions related to your maize production and marketing in year 2013/14. The interview will take about 35 minutes and the information you will provide for us will be confidential and only used for the purpose of this postgraduate research degree study. Therefore be free to give us your views and opinions about the effects of NTBs on maize production and marketing.

Part A: Socio-economic demographic information

A1. Questionnaire number.....	
A2. Date of the interview.....	
A3. Name of interviewer.....	
A4. Respondent Name.....	
A5. Name of village.....	
A6. Name of ward.....	
A7. Name of district.....	
A8. Respondent Age Years	
A9. Gender of respondent	<input type="checkbox"/> Male <input type="checkbox"/> Female
A10. Respondents' highest level of education	<input type="checkbox"/> Informal school <input type="checkbox"/> Primary level school <input type="checkbox"/> High school <input type="checkbox"/> College/university <input type="checkbox"/> Others
A11. How many people belong to your family Number	
A12. What is your main occupation? (Tick one)	<input type="checkbox"/> Farmer <input type="checkbox"/> Farm laborer <input type="checkbox"/> Crop collector <input type="checkbox"/> Wholesaler <input type="checkbox"/> Retailer <input type="checkbox"/> Handyman <input type="checkbox"/> Artisan / craftsman <input type="checkbox"/> Private business <input type="checkbox"/> Government servant <input type="checkbox"/> Student <input type="checkbox"/> Unemployed
A13. How many years have you been in that occupation?..... Year	

B. FARM INFORMATION		
B1. What are the main staple food crops do you grow on your farm (Tick all that apply)	<input type="checkbox"/> 1 Maize <input type="checkbox"/> 2 Rice <input type="checkbox"/> 3 Sorghum/millet/wheat <input type="checkbox"/> 4 potatoes/sweet potatoes <input type="checkbox"/> 5 sunflower <input type="checkbox"/> 6 Cassava <input type="checkbox"/> 0 other (specify)	
B2. Which one crop is the major source for cash?		
B3. How many years have you been growing maize?.....Years		
B4. Total land area owned (including your house)	m2	
B5. Total land rented from others	m2	Rent (TSh).
B6. Total land rented to others	m2	Rent (TSh).
B7. Total land neither rented nor owned	m2	
B8. Total area cultivated last season for maize	m2	
B9. Total area cultivated last season for rice	m2	
B10. Total area cultivated last season for groundnuts	m2	
B11. Total area cultivated last season for beans	m2	
B12. Total area cultivated last season for sunflower	m2	
B13. Total area cultivated last season for potatoes	m2	
B14. Total area cultivated last season for coffee	m2	
B15. Total area used for all staple crops production last season(2012/2013)	m2	

PART C: INPUTS SOURCE AND USE INFORMATION

C1. Where do you obtain most of your inputs?	<input type="checkbox"/> Input shops <input type="checkbox"/> Trader at farmstead <input type="checkbox"/> Contract-growing arrangements <input type="checkbox"/> Use own input from previous season <input type="checkbox"/> Gifts <input type="checkbox"/> Others (specify)
C2. Name the place where you normally get your inputs	1..... 2..... 3.....
C3. How far is the place where you normally obtain your inputs?	Km

C4. What kind of seeds normally do you use in your maize farm? (Tick all applies)	<input type="checkbox"/> Improved seed <input type="checkbox"/> Local seeds from <input type="checkbox"/> Own seed saved from previous season <input type="checkbox"/> Others (Specify)
C5. Quantity of seeds used in one acre of maizeKg
C6. What kind of fertilizers do you normally use in your farm?	<input type="checkbox"/> Chemical/inorganic fertilizers <input type="checkbox"/> Organic fertilizers <input type="checkbox"/> Manure <input type="checkbox"/> Not applied <input type="checkbox"/> others
C7. Mention the amount of fertilizer used in one acre of maize in 2013/2014 seasonKg
C8. What is the price of one bag of 50 Kg?	CAN.....TZS DAP.....TZS

PART D: Production and marketing information for season 2013/2014

D1. Crop	Area	Form of production	Beginning of Harvest (Month)	End of harvest (mention month)
	Km	Intercropped Pure stand Others		
Maize				
Rice				
Coffee				
Beans				
sunflower				

Sales information for complete production season cycle of 2013/2014

D5. Crop	Total harvest (Kg)	Amount sold (Kg)	Main place of sale	Main buyer
			1. farm 2. Home 3. village market 4. district market 5. public gathering place 6. other (specify	1. Households 2. Other farmers 3. Middlemen 4. Collectors 5. Wholesalers 6. Export agents 7. Cooperative society 8. Street vendors 9. Restaurants/shops
Maize				
Rice				
Bean				
Ground nuts				
Sunflower				
coffee				

D6. Crop	Total revenue (TZS)	Minimum price (TZS/Kg)	Maximum price (TZS/ kg)
Maize			
Rice			
Bean			
Ground nuts			
Sunflower			
coffee			

PART E: Transportation and storage of crops harvested

E1. Are you responsible of transporting your produce to the trading partner/buyer?	Yes NO
E2. What means of transport do you use to move your produce to sales place? <i>(Tick all applied)</i>	<input type="checkbox"/> Bicycle <input type="checkbox"/> Motorbike <input type="checkbox"/> horse/ ox cart <input type="checkbox"/> car <input type="checkbox"/> pick-up <input type="checkbox"/> donkey /with cart <input type="checkbox"/> public transport
E3. Average time of transportation to selling place (in Hours)	
E4. Average transport costs (in TZS/Kg)	
E5. How are cereals stored immediately after harvest? <i>(Tick only one)</i>	<input type="checkbox"/> no storage after harvest <input type="checkbox"/> outside under a shade <input type="checkbox"/> outside under sun <input type="checkbox"/> storage structure (vihenge) <input type="checkbox"/> Inside the house in ceiling <input type="checkbox"/> in jute bags <input type="checkbox"/> in plastic bag <input type="checkbox"/> other (specify

PART F: Trade Barriers Information

F1. Is there any trade restriction in your village	YES NO
F2. What types of trade barriers exist in your village? <i>(Tick all the applied)</i>	<input type="checkbox"/> Road blocks <input type="checkbox"/> Weighbridges <input type="checkbox"/> Levy/cess <input type="checkbox"/> Corruption <input type="checkbox"/> Council permits <input type="checkbox"/> Trade license <input type="checkbox"/> Custom procedures <input type="checkbox"/> Police check points
F3. Which one of the barriers you mentioned	1.....

above are common (Mention only three)	2..... 3.....
F4. Do they have any effects on your maize production and marketing?	YES NO
F5. If YES, What are these effects on your maize production and marketing? (<i>Tick all applied</i>)	<input type="checkbox"/> Low prices <input type="checkbox"/> Remained with unsold surplus <input type="checkbox"/> Corruption <input type="checkbox"/> Increased cost of transport and storage <input type="checkbox"/> Others
F6. Do you pay any cost in clearing the barrier?	YES NO
F7. If ‘‘YES’’ How much do you pay at each form of barriers (TZS/per kg/trip)	1. Road blocks..... 2. Weighbridges..... 3. Levy/cess..... 4. Corruption..... 5. Council permits..... 6. Trade license..... 7. Custom procedures..... 8. Police check points.....
F8. What suggestion do you recommend to the government in order to improve the production and marketing of maize?	1..... 2..... 3..... 4.....

PART G: Attitudes toward selling of maize in future by farmers

G1. Would you like to sell more maize than what you are currently selling now?	YES NO
G2. If ‘‘YES’’, what is currently preventing you from selling more of them to market? (Tick all that apply)	<input type="checkbox"/> Market price is comparably low <input type="checkbox"/> Lack of capital <input type="checkbox"/> No access to good quality seeds <input type="checkbox"/> No manpower <input type="checkbox"/> Poor infrastructure system <input type="checkbox"/> existing food taboos <input type="checkbox"/> too little production for sale surplus <input type="checkbox"/> too many sellers and very few buyers <input type="checkbox"/> climatic reasons <input type="checkbox"/> higher susceptibility to pests & diseases <input type="checkbox"/> lack of land <input type="checkbox"/> other (specify

PART H: Households' income in year 2013

Source of income	Amount (TZS)
Maize sales	
Rice sales	
Beans sales	
Sunflower sales	
Groundnut sales	
Coffee sales	
Retail shop	
Hawkers	
Carpentry	
Local brewing	
Livestock trading	
Traditional doctor	
Fishing	
Butchery	
Tailor and Wearing	
Employment (Salary)	
Remittances	
Others (Specify)	
Total	

PART I: Households Expenditures in year 2013

Item	Qty from own production	Qty purchased (kg/litter)	Price/ unit	Amount (TZS)
Food items				
Clothing & shoes				
Fertilizer				
Seeds				
Chemicals				
Home Furniture				
Animal feed				
Hired labour				
Hired land				
Hired oxen				
Animal bought				
Health/medicine				
School fees				
Travelling expenses				
Income taxes				
Ceremonies				
Others				
Total				

PART J: Assets owned by household farmers in 2014

Assets	Quantity	Price per unit	Value (in TZS)	Uses
Radio				
TV set				
Bicycle				
Motor bike				
Sofa set				
Ox cart				
Tractor				
Refrigerators				
Sewing machine				
Mobile phone				
Hand hoes				
Plough				
Cattle				
Goats				
Chicken				
Ducks				
Sheep				
Horse				
Donkey				
Powertiler				

Thank you for your collaboration

Appendix 2: Questionnaires used for traders' interview at Tunduma and Mlowo markets

1. Name (Optional)
2. Address (Mobile Phone)
3. Main crops traded.....
4. Level of trades
 - a. Villages Collector.....for whom
 - b. Middle manfor whom
 - c. Agentfor whom
 - d. Full trade
5. Nature of trade agreements between you and farmer.....
6. Where do you mostly buy your maize produce? (Tick all that apply)
7. Farmers field,
8. Farmers house,
9. Village market,
10. Milling machine,
11. Other (specify.....) Give reason for your choice
12. How much price do you offer to farmer (TZS/Kg).....?
13. How price is reached between you and farmers.....
14. What is the basis for agreed prices?
15. Is there any crop trade barrier in your business environment? YES NO
16. If "YES" What are these barriers? (Mention them)
 - a.
 - b.
 - c.
 - d.
 - e.
17. Which institution institutes these crop barriers.....?
18. Do you pay any cost in clearing any NTBs? YES NO
19. If 'YES' How much do you pay at each type of NTBs?

.....

.....

.....
20. Are there any formal payments in each barrier? YES NO
21. If "YES" How much do you have to pay in total?
22. Are there any informal payments along the way to markets? Where and how much?.....
23. Do you incur any extra costs in terms of accommodation costs resulting from delays at border posts? YES NO
24. If "YES" How many days and how much per day do you pay.....

25. Estimate the additional employee time and wages incurred due to delays on road, obtaining documentation etc.....
26. What is your opinion on the effect of trade barriers on your business activities?
.....
.....
27. Have you ever thought to diverge from the barriers? How and why.....
28. Do you have trade license? YES NO
29. If yes, tell me the procedure of obtaining license.....
30. Do you pay taxes? How many and how much?
31. Which government action is needed to ensure smooth maize business in Tanzania?
.....
.....
.....

Thank you for your collaboration

Appendix 3: Transporters checklist questions

1. Name (Optional)
2. Address (Mobile phone.....)
3. Main food crops transported.....
4. Main type of transport used.....
5. Levels of transport by a transporter.
 - a. Within the Villages
 - b. Village to district
 - c. Village to region town
 - d. Village to Dar es Salaam market
 - e. District/region to Dar es Salaam
 - f. Village/district to export markets
6. Depending from transport levels above, how do you charge to transport crops per unit/kilometer?
7. What is the basis of agreement for the said transportation costs?
8. In addition to cost of your lorry what payments must be made to the authority your vehicle road worth?
9. While transporting crops do you pay any taxes/levy to the village, market, town, regions? YES NO
10. If yes, suppose you are transporting full load from the village/district to region/Dar es salaam, how much to you pay in total.
11. List number and location of barriers you will accounted on the way to region or Dar es Salaam/Moshi markets.

12. Are there any formal payments in each barrier? YES NO
13. If YES, How much do you have to pay at each barrier?
14. Are there any informal payments along the way to markets? Where and how much do you pay at each barrier?
15. What are procures of transporting crops across the border, payment to be made and duration to get clearance (Only for traders who export maize).
16. In your opinion, are there any effects of these trade restrictions to the economy of the farming community?
17. Which government action is needed to ensure smooth maize trade in Tanzania
18. Do you have any suggestions to the government regarding NTBs?

Thank you for your collaboration

Appendix 4: Focus group discussion (FGD) /Key informants' checklist questions

What do you understand about trade barriers?

.....

Are there any trade barriers in your village / district? Can you mention them?

.....

Which among you mentioned trade barriers are non tariff barriers?

.....

Which among NTBs you mention are specifically for staple food crops like maize?

.....

From the barriers you mentioned above which related to maize trade and production, mention three of them which are frequently implemented in your area.

1.....
 2.....
 3.....

How much at each NTB a farmer or trader has to pay.....

What are their possible effects on the maize production and trade in your village/ district?

.....

Do you thing the presence of NTBs in your village/district has reduced or increased maize production and trade? Give reasons for your answer.

.....

How do you say about the perceptions of farmers and traders on the existence of NTBs?

.....

Can you recall the year and months in which the NTBs were instituted on maize exports in your village/ district for the period from 2008 to 2013?

.....

Is there anything do you think the government should do in order to encourage more maize production by farmers?

.....

Thank you for your collaboration