DETERMINANTS OF MARKET PARTICIPATION AMONG SMALLHOLDER RICE FARMERS IN TANZANIA

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By

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CERTIFICATION

The undersigned certifies that the supervisor has read and hereby makes a recommendation to the University of Dar es Salaam to accept this dissertation entitled: ***"Determinants of Market Participation Among Smallholder Rice Farmers in Tanzania."***

Signature ……

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Signature…….

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(Supervisor)

Date……

DECLARATION

AND

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I, **Mpombo Lucy Bosco**, declare that this thesis is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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Date……..

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DEDICATION

I dedicate this dissertation to my parents, my supporting father Bosco Christian Mpombo and Dinna Mjema, my adorable mother. Not forgetting my only brother, Christian Mpombo, I pray this inspires you.

LIST OF ABBREVIATIONS

BRN	Big Results Now
ESRF	Economic Social Research Foundation
FAOSTAT	Food and Agriculture Organization Statistics
GDP	Gross Domestic Product
HCI	Household Commercialization Index
KG	Kilograms
MOI	Market Orientation Index
PCA	Principle component Analysis
STATA	Statistical Analysis
URT	United Republic of Tanzania
USAD	United States Development

ABSTRACT

Market participation among smallholder farmers in developing countries is a crucial economic venture since it elevates their poverty status and ensures food security. The study aims to determine the factors that affect the smallholder rice farmers' market orientation tendencies, market participation decision and finally the extent of market sales in Tanzania. A total sample of 352 rice growing households is drawn from the National Panel Survey Data of 2014/2015.

The study uses the household as a unit of analysis since it is assumed that he represents the entire households' decisions. The study uses 2 models: the first is a Tobit model that seeks to determine the factors that influence market orientation tendencies. Later a double hurdle model which seeks to analyze the determinants of the two sequential hurdles (participation and intensity) to be crossed by the smallholder rice farmer.

The study finds out that the age of the household head, secondary level of education and receiving inputs on voucher system negatively affects market orientation while access to market extension, use of inorganic fertilizers, use of animal traction, hiring labor, land fragmentation and wealth of the household positively influence market orientation inclinations among smallholder farmers.

For the second model, the harvest quantity and wealth of the individual were found to positively influence both decision and extent of market participation. Furthermore, the age of the head, family size and access to extension services influenced the decision to participate in the market while market distance and market orientation highly influenced the extent of market participation among smallholder rice farmers in Tanzania. The results imply that interventions to enhance market orientation would highly increase quantity sold, while improving access to marketing information through extension agents could improve both market orientation and decision to participate among smallholder rice farmers in Tanzania.

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CHAPTER ONE

INTRODUCTION

1.1 Background

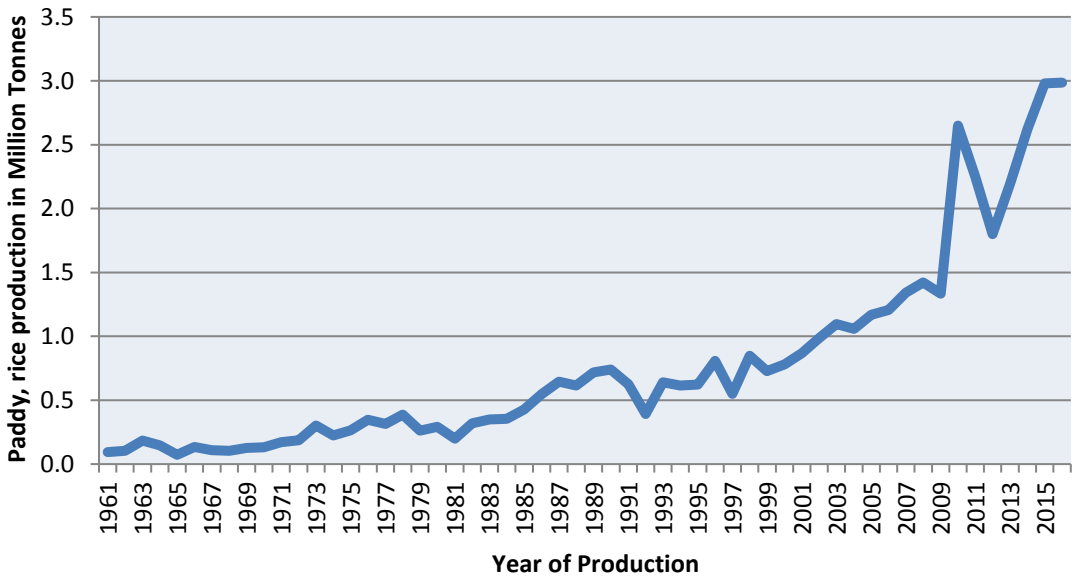
The majority of African populations live in the rural areas where most of them depend on agriculture as a means of livelihood. In Tanzania, of the approximated 50million people, rural population is estimated to be about 70%. Of these, most of them depend on agriculture production which contributes about one-third to the GDP also employing about 80% of the labor force. The current annual growth is about 4.2% and this is expected to grow to 6%. The poor performance of agriculture, amongst others, is mainly attributed to weak agro-processing industrial base, and unsuccessful transition from subsistence to commercialized agriculture(URT, 2016b).

Rice also known as paddy is one among the major food crops cultivated in Tanzania(Report & Sage-el, 2018; United, Of, Of, & Food, 2009).It is the second most important cereal in Tanzania after maize and 90% of all rice production is undertaken by smallholder farmers (United et al., 2009).It is estimated that about 18% of farming households grow rice and the resulting economic activities for the production of rice contributes about 2.7% to the overall GDP of the country(Report & Sage-el, 2018).

The general trend in rice production has been increasing over time from 1961 to 2016. The data from FAOSTAT indicates that paddy production has been increasing over time for the past 55 years. This has even been enhanced by a further introduction of various policy interventions that have facilitated increase in paddy productivity. Among them are the KILIMO KWANZA declaration, The National

Rice development strategy of 2009 and most currently the National Five Year Development Plan 2016/17-2020/21. KILIMO KWANZA declarative has especially set out to increase the marketable output of agricultural produce for Tanzanian smallholder farmers. The main reason behind is that most of the smallholders households depend on agriculture to make ends meet(ESRF, 2014; GROUP, 2009). Figure 1.1 below clearly shows the general trend in the increase of rice production. Right from the beginning of early 1960s, the total rice production overtime was less that 0.5 million tones until around the year 1986. From then onwards, rice also became a common household meal, together with maize. So most farmers started considering it for cultivation. Over time, with improved technologies and increase in the area of rice cultivation due to irrigation possibilities, the production of rice picked up to more tonnes. Recently, it has achieved a total production of approximately 3 million tonnes which is approximately 223% increase from the year 1961 to 2016.

Figure 1.1:Paddy Production Trend (Tonnes)



Source: Adopted from (URT, 2016b)

Furthermore, National Rice Development Strategy and National Five Year Development Plan 2 all aim at increasing rice productivity by improving technological adoptions among smallholders; use of improved agricultural inputs and irrigation. However also to further rice commercialization since as the production of rice is increasing, definitely the surplus will need to be marketed in order to realize income (URT, 2016b).

Despite such huge increase in agricultural productivity, the marketing side of the value chain has remained far from optimal. Majority of farmers either do not sell or sell at relatively low prices and what rives their choices is less clear.

Smallholder Agriculture commercialization refers to the process where the smallholders shift from producing subsistence levels to semi-commercial and commercial production, mainly for marketing purposes. This entails producing surplus amounts of agricultural produce. Commercialization involves a complex process where the household has first to make decision concerning consumption and production. While the household decides to produce surplus for marketing, then it still will need to make sound decision on the levels of inputs and consequent choices on agriculture such as adoption of new and advanced technology that would realize increased output (Berhanu,Gerbremedhin; Moti, 2010).

There are enormous advantages that may accompany commercialization of the smallholder agriculturalist. Such like benefits include; increased incomes and agricultural profits from selling the surplus production, creation of jobs and increasing labour incomes for the locals, lowering food prices hence benefiting the poor, provision of constant supply of food for urban dwellers and also it has indirectly improved the food security situation of the household and the community

as a whole. Furthermore, commercialization plays a greater role of improving the market linkages between the input and output markets (Pingali L P, 1995).

Although the whole process of commercialization is beneficial, there are several challenges. Such can be grouped into four major categories including; transaction costs, availability of productive assets and technologies and other institutional factors. Smallholder commercialization in Tanzania is still marginal with only 25% of the farmers actually selling half of their total production, while about 26% of other smallholders do not sell any of their produce (World Bank, 2011).

Despite the increased production of most food crops, rice included, most smallholders have not exhausted the market opportunities that come with production of surplus. There are several reasons as to why this is the case as a report by (ESRF, 2014) states that most smallholder farmers produce quite large amounts of crops, less than 25% of the surplus reaches the market. A report by (ESRF, 2014) further cements the idea that most of the exported crops are mainly cash crops, including cotton, sisal, coffee and tea. Food crops are not the leading exports mainly because of policy issues that hinder the smallholders to engage in their exportation for food security reasons. This is a major drawback since there could be major market opportunities in the neighboring countries that would generally be left undiscovered.

In addition to low market participation levels from the output side, most studies don't mention on an important concept that underlies commercialization, namely market orientation. This is defined as agriculture production that is destined for market based on responses from the market signals such as prices. While market participation looks at the final outcome where the farmer eventually decides to sell his output or buy the inputs he needs, market orientation focuses on the behavior of the farmer

from the onset of achieving the agriculture produce that he later sells. Market orientation mainly looks at how the farmer responds to market signals such as increase in demand and hence prices for the agricultural produce and lower cost hence higher profits to be realized from engaging in a particular agriculture venture(Berhanu,Gerbremedhin; Moti, 2010).

Hence, as much as market participation is the end, market orientation is definitely the means. My study will therefore look into both market orientation and market participation in depth. This is to see if smallholder farmers are really keen at responding to market signals that will translate into their behavior afterwards. It is not enough to participate in the market. Sometimes, marketing of produce is very risky because of the uncertainty of prices of agriculture products and definitely the demand for the produce. There is a need to look into both the means and the end before coming to conclusion about the determinants of market participation.

1.2 Statement of the problem

Rice is the second most important food crop for most Tanzanian households. There has been a general increase in the production of rice as observed over time from about 9.0 tonnes in 1961 to approximately 2.7 million tonnes in 2016 (FAOSTAT, 2017). Despite this increase in rice production, there has been low level of commercialization of the cereal. The main market is found in the urban areas alone, perhaps 10-20% in Dar es Salaam city and less in other urban areas (USDA, 2017).There is almost nothing to talk about for rice exportation due to various policy issues and ensuring food security (ESRF, 2014).

Significant barriers to entry exist for the smallholder rice farmers to effectively sale their surplus produce into the market. Most studies points out that the poor farmers

have a relatively low market participation compared to their non-poor counterparts. This he attributes to limited ability to produce surplus, low literacy levels, small farm sizes among others. Furthermore, empirical literature on agriculture market participation significantly identifies barriers such as lack of extension services, high transaction costs associated to marketing such as distance to the market and poor market orientation among farmers.

Consequently, poor market participation among rice farmers will result into increase in poverty levels among farmers and possibly food insecurity. Most Sub Saharan studies have not looked into the concept of market orientation and how it factors into market participation. This study then aims to identify the factors that determine market orientation and participation among smallholder rice farmers.

1.3 Objective of the Study

The main objective of the study is to analyze the determinants of market orientation and participation among smallholder rice farmers in Tanzania. Specifically, this study will endeavor to;

i) To establish the level of market orientation and market participation among smallholder rice farmers.
ii) To examine the factors that determines market orientation among smallholder rice farmers.
iii) To examine the factors that determines market participation decision and extent of sales among smallholder farmers.

1.4 Research Questions

i) To what extent do smallholder rice farmers participate in marketing their produce?

ii) What factors determine market orientation of smallholder rice farmers?

iii) What factors determine decision and extent of market participation among smallholder farmers?

1.5 Significance

This study will help increase the stock of knowledge and literature on factors affecting market orientation and market participation for smallholders in developing countries, specifically Sub Saharan countries. Further the study will clarify the concept on market orientation hence examining if it really is a factor that will shape market participation for most smallholder farmers.

1.6 Organization of the Study

This research study is structured into six chapters where the first of them begins with an introduction and background to the study of rice production and marketing in Tanzania. Then it is followed by chapter two which looks deeply into the overview of the Agriculture sector in Tanzania with specific focus on Rice as a second most important food-cash crop. Chapter three entails theoretical and empirical literature on market participation and market orientation for smallholder rice farmers in Tanzania. Chapter four presents the study methodology as well as the data and its sources, the specific variables used and their hypothetical expected outcomes. The empirical findings and respective interpretations are critically discussed in chapter five. Then finally chapter six presents the conclusion, policy implications and recommendations, and of course areas for further research.

CHAPTER TWO

OVERVIEW OF TANZANIA'S AGRICULTURE SECTORAND TRENDS IN PADDY/RICE PERFOMANCE.

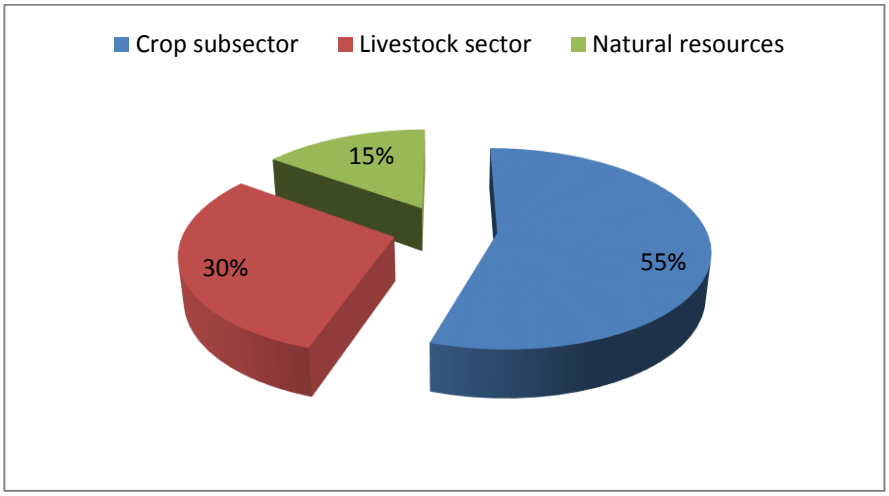
2.1 Introduction

Basing on the background of the preceding chapter, a detailed discussion is made here concerning the overview of Tanzania's agriculture sector and the general trends in rice performance over time including production and consumption trends alongside the export and import trends. Later on the chapter sheds light on the policy environment especially in the agriculture sector and how these policies support rice production and marketing as a staple food-cash crop in Tanzania.

2.2 Overview of The Tanzania's Economy

The Tanzania's agriculture sector is extremely diverse. Figure 2.1 below shows that crop production contributes at least fifty five percent of the agriculture sector GDP, livestock contributing thirty percent and natural resources contributing about fifteen percent. Rice is the second most prominent crop. Of all Tanzania's farmers, about sixteen percent grow rice where ninety four percent are smallholder and only six percent being large scale farmers(URT, 2016b).

Figure 2.1: Agriculture Sub-Sector Division in Tanzania



Source: (URT, 2016b)

Tanzania is targeting a 6% growth in the agriculture sector while currently it is only 3.6 %. There are three classes of farmers that are very essential to ensure relevant growth rate(URT, 2016b). These include large commercial farms, small commercial farms and lastly the rural non-farm population who have relatively smaller sizes of land. In order to attain 6% targeted growth, the main focus is on smallholder commercial farmers(ESRF, 2014).

The smallholder commercial farmers own a total of 69% agricultural land which is approximately 1.26 to 5 hectares; they definitely have a significantly larger share of the total output of agricultural products. On the other hand, the large commercial farmers cultivate about 15% of the total land. In order to realize the 6% target, more emphasis should be given to the smallholder farmers. They are the largest number, approximately 3million families dwelling in rural households(URT, 2016b, 2016c).

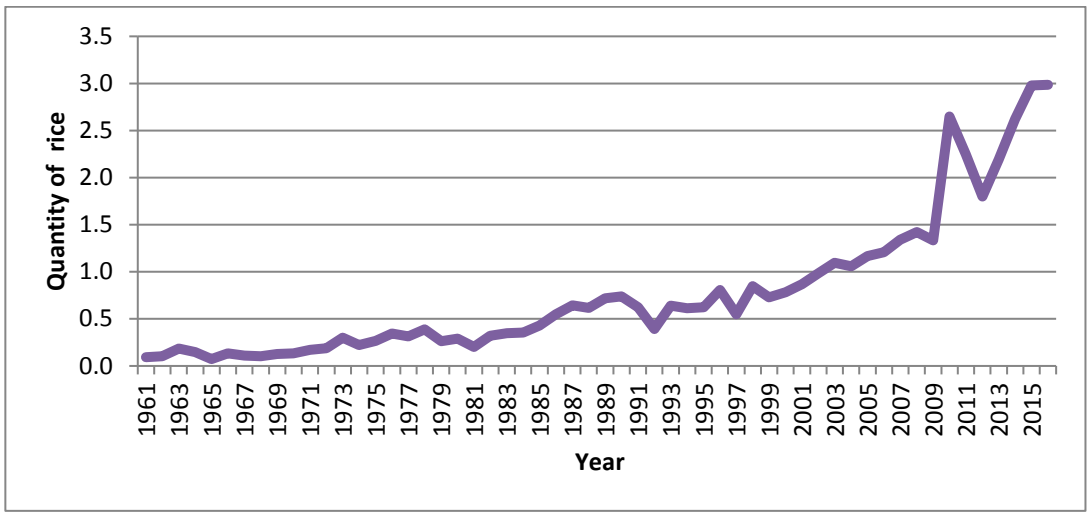
2.3 Performanceof Rice Crop in Tanzania

In this section of the chapter, the trends in rice production, consumption, exports and imports are looked into closely in order to establish the performance of rice as a crop in Tanzania. The section begins with rice production and consumption trends for over the past five decades, looking at how the trends are changing over time. Later on, the section looks into rice marketing in Tanzania, still for the past five decades. Here rice exports and imports are looked into given the fact that the productivity of rice has been increasing over time.

2.3.1 Rice Production and Consumption Trends in Tanzania

While the small scale farmers are the main producers of rice, the marketing is mainly dominated by middlemen and traders. The figure 2.2 below clearly shows that rice harvests have been increasing for the past decade. From the beginning of early 1960s to 2010 the trend has been increasing, with a few fluctuations. This has also resulted into an increase in rice productivity in the past decade (approximately 1-1.5tonnes per hectare), this trend is generally lower than what is observed in most neighboring countries. The main factors that have resulted into the increase of rice production include the increase of land that is devoted to rice cultivation, adoption of improved rice seed varieties for Africa (like NERICA, TXD306, IRO5N221 and IRO3A263) and use of inorganic fertilizers and herbicides(ESRF, 2014).

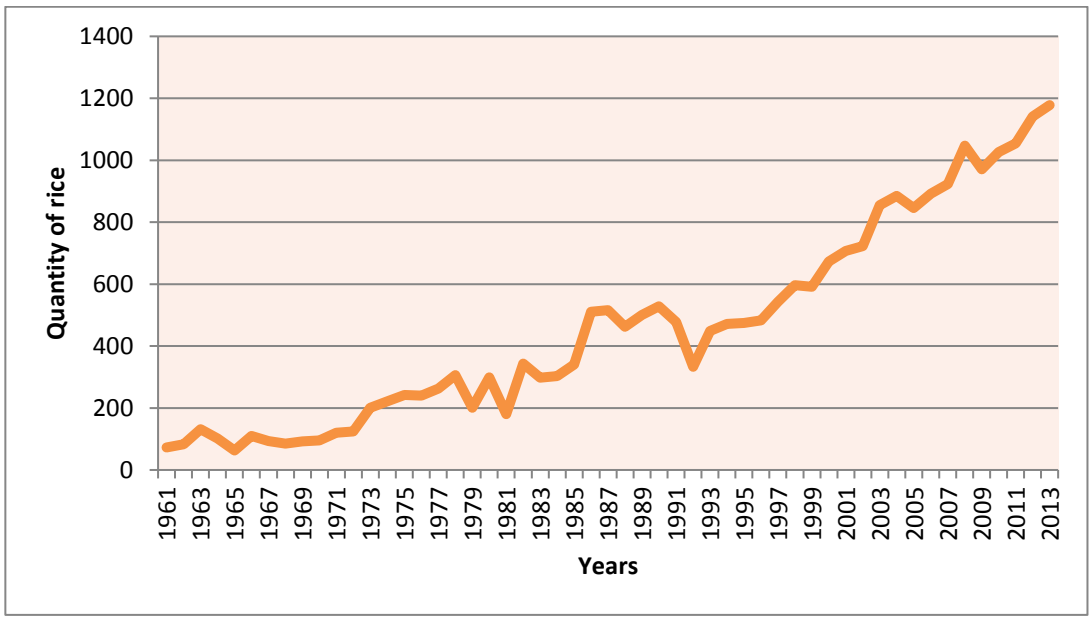
Figure 2.2:Rice Production Trend 1961-2017



Source:(URT, 2016b)

The figure 2.3below shows the trends in rice consumption over time. Rice is the second most important staple food crop after maize. It is highly consumed in both the rural and urban areas where the particular consumers in Tanzania are very keen on the colure, taste and flavor and grain size. Dar es Salaam as a main city accounts for approximately 60% of the total national rice consumption levels. The city is a home for approximately one third of the total nation's population. The rural consumers are the smallholder farmers who retain approximately 370 kg for their own home consumption (Report & Sage-el, 2018). Irrespective of the fact that the retail prices for rice have been increasing, the consumers have not been discouraged from purchasing rice for their home consumption. The other major important reason for the continued growth in rice consumption could be attributed to its aromatic preferences and the continued increasing usage in festival seasons, social gatherings and social functions. Moreover, rice is considered as a superior meal. Hence for that matter population and income increase over time has resulted into increased consumption of the cereal.

Figure 2. 3:National Rice Consumption Trend 1961-2017

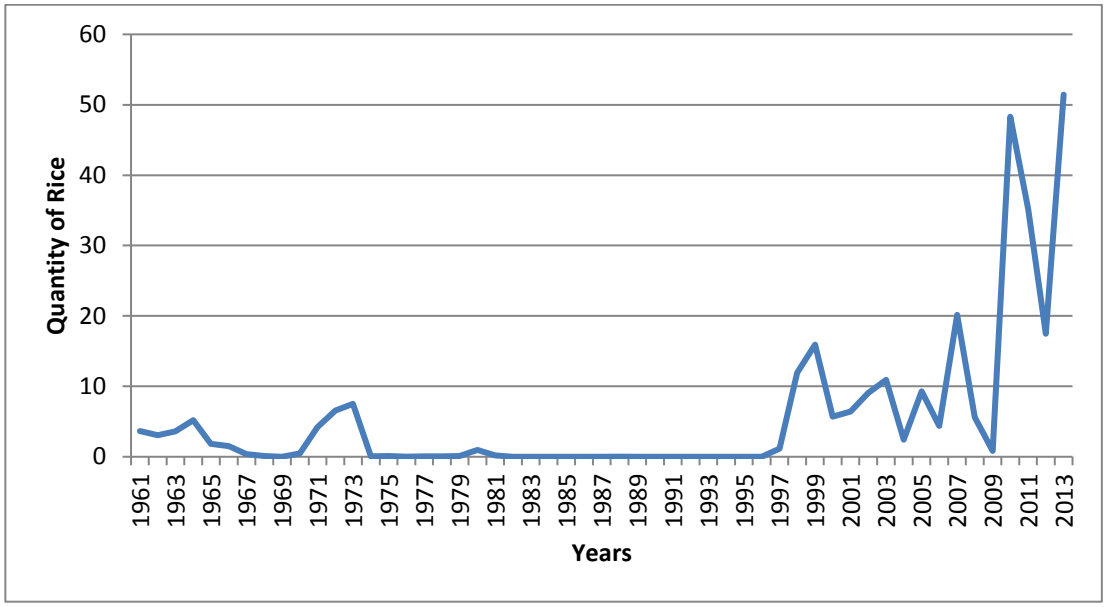


Source: (URT, 2009)

2.3.2 Rice Marketing in Tanzania

Since there is an increasing demand for rice as a staple food, the trends in exports of the crop have been fluctuating. Rice exports have mainly been discouraged by the fact the government of Tanzania has set up many regulations in place to prevent exportation of rice to ensure the nation's food security(ESRF, 2014). Figure 2.4 below shows that in the years between 1970s and late 1990s, there were virtually no exports from the country. This could possibly be because the production trends of rice were also low, mostly sufficient for the country's consumption. Then afterwards in the early 2000s, the levels of exports began to rise and also fall. In between the year 2000 to 2010, the export levels have been fluctuating with the year 2014 recording the highest level of rice exports, approximately 52 million tonnes.

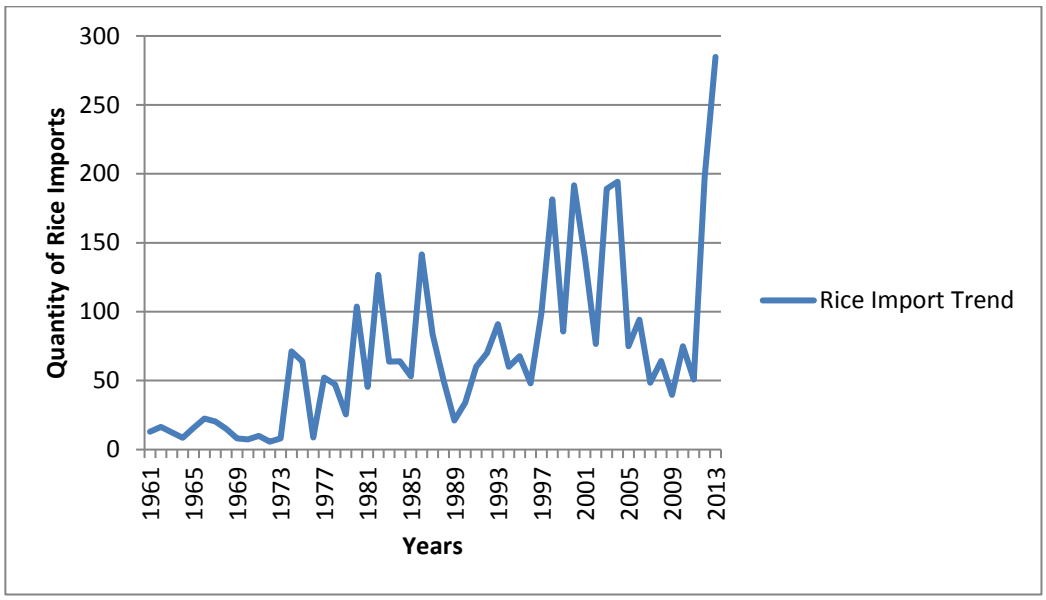
Figure 2.4:National Rice Exports in Tanzania; 1961-2014



Source:(URT, 2009)

On the other hand, the figure 2.5 below shows that rice imports have been increasing in the country. As compared with the year 1960s where the amount of rice imported was less than 50 million tonnes, the amount started rising in the mid1970s and since then quantities have been fluctuating with the year 2013 establishing the highest levels of rice imports, approximately 270 million tonnes.

Figure 2.5: National Rice Imports in Tanzania; 1961-2013



Source:(URT, 2009)

2.4 Agriculture Policies that Support Rice Production and Marketing

In this section, the study investigates the policies that support the establishment and thriving of the agricultural sector in Tanzania, with the main focus in rice production and marketing. Most of the policies discussed below are still in the process of implementation, whereas some are new.

2.4.1 Agriculture Marketing Policy

The policy was formulated in 2008 with the major aim of facilitating strategic marketing of agricultural products in order to ensure fair returns to all the involved parties based of efficient, equitable and competitive market system. The policy aims to ensure that by being market oriented, the rural farmers will generate more income. The policy supports various issues that deal with marketing that include; developing marketing infrastructure, market institutions and fostering international trade. Furthermore it realizes the importance of continuously providing market information

to the rural smallholders beforehand. Such information is like price of the product and the level of demand in different areas. This is to support the farmers as they make decisions on whether to sell their produce or otherwise and the total quantity of produce to sell(URT, 2008).

2.4.2 Big Results Now

Big Result Now (BRN) was an initiative formulated and adopted in the year 2013/2014. This had major aim of transforming the economy in order to achieve sustainable economic growth and also ensuring inclusive creation of wealth. The initiative was to concentrate on major areas including transport, education, agriculture and health. Regarding agriculture sector, the major aim was improving smallholder irrigation scheme so as to increase the total agriculture production of farmers. It also aimed at promoting commercial farming. This is mainly to ensure that smallholder farmers are not only subsistence growers but also commercial oriented cultivators(URT, 2016b).

2.4.3 Agricultural Sector Development Strategy 2

This was formulated in 2015 with a life span from 2015 to 2025. The major aim of the strategy is to transform the agricultural sector into modern, commercial and highly productive levels in order to fair well at national and international markets. It mainly targets at achieving and maintain the six percent growth rate for Tanzania's Agriculture sector. It covers four most important areas of intervention, one of major interest to this study is the second area that aims at improving agricultural productivity and profitability. In order to achieve this, the strategy aims at improving agriculture extension services, increase access to farm inputs like fertilizer and improved seeds especially for smallholder farmers even if it would mean using input

subsidy. Furthermore, it aims to increase access to agriculture mechanization by collaborating with the private sector. This is by assisting the smallholder farmer access and use modern mechanization technology like tractors and power tillers in order to improve productivity. It also aims at improving market accessibility and developing rural infrastructure to reduce transaction costs that would encourage smallholder to participate in selling their output(URT, 2016a, 2016b)

2.4.4 Second Five Year Development Plan

This was formulated in 2015. It will last for five years with a major aim of transforming the country into an industrialized economy. This plan still recognizes the agriculture sector as the central to Tanzania realizing industrialization since the sector produces employment opportunities for about sixty seven percent of the population. Rice is mentioned among the prioritized crops. Regarding rice as a crop, the plan aims at achieving the following strategy; expanding and improving irrigation schemes. This is with a major aim to increase productivity since due to climate change, rainfall is unreliable and there is so much arable land that has been left underutilized. Also it plans on improving extension services, improving access to financial services, infrastructure and encouraging commercialization among smallholder farmers. Moreover this plan is aiming at supporting the rice subsector to increase the use of modern technology(URT, 2016d).

2.5 Conclusion

This chapter has reviewed the Tanzania's agriculture sector with specific consideration to the rice crop performance over time. The chapter specifically reviews the production, consumption export and import trends in rice as a food-cash crop in the Tanzania economy.

Secondly there is revealed the major factors that hinder the performance of the rice sector over time. Marketing practices in the rice sector is also covered focusing on the rice markets and prices in Tanzania and how they have been behaving over time. Lastly the chapter analyses the policies and strategies that have been employed in the country in order to improve the overall agricultural production and rice subsector to be particular. The policies and strategies outlined in the country's national statement seem to be committed to take the rice subsector performance onto higher levels of development. For that matter, this is what has motivated this study to look into detail the impact of the factors on the market participation of especially smallholder rice farmers, who make up the larger percentage of rice producers in Tanzania.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter explores both theoretical and empirical literature from the previous works on market participation of smallholder farmers. The chapter is divided into 3 sections whereby section 3.1 presents the theoretical literature which gives a backbone and hence a theoretical basis for this analysis. Then section 3.2 explores the most relevant empirical literature on the topic so as to give us a practical and realistic view of how the matter in consideration can be investigated. Finally section 3.3 provides the synthesis of the study and the research gap which the study will address.

3.2 Theoretical Literature

According to household production theory, households are assumed to be involved in making both production and consumption decisions concerning tradable and non-tradable goods. For this case, the theoretical review below will look into how different theories are related to market participation decision and extent among smallholder farmers. This section will review several theories that include: Household production theory, Household farm theory, Random utility theory and transaction cost theory.

3.2.1 Household production theory

This is a theory that studies the household production, consumption and time allocation decisions. The theory defines a family unit as the entity that is responsible for both production and consumption decisions of goods and services. The main goal of the theory is to elaborate the relationship and interaction between production,

consumption and time allocation decisions. Hence in order to maximize utility, the family attempts to efficiently allocate income, time and the mobilization of goods and services for both consumption and production decisions.

The main assumption of the theory is the fact that the family unit is a rational actor. The theory further applies the basic concepts of marginal utility, supply and demand. In relation to this study, the theory fits in well to first determine the factors that affect the extent of crop produce that is supplied to the market. This is because the quantity supplied is usually the difference what is produced and consumed. Hence, given several factors like family size, area planted and use of labour, the family unit is likely to supply more or less to the market. This is because some of the mentioned factors above like family size will affect the total quantity consumed while area planted is likely to affect the realized harvest. Hence the family unit being rational actor, it will decide accordingly concerning the produced surplus(Sawit, 1993).

3.2.2 Household Farm Theory

On the other hand, (Tamboto, 2015) observes the farmer's household behavior with the economic perspective where he affirms that using the household farm theory, the smallholder household is an important agent in making decisions in the aspects of production, consumption and lastly the allocation of time among the household members. The household farm theory considers a semi-commercial family farm with a competitive labor market. This semi-commercial farm is characterized by a separable decision on the levels of production and consumption with the aim of making profits and use of both family and hired labor in the farms.

The main assumption of this theory is that the household makes a dual role in decision making concerning production and consumption. In addition to that, the

household is faced with certain constraints that include cash income, family time and endowments of fixed productive assets and production techniques. For that case then (Sawit, 1993) defines the smallholder farm household as a firm or rather a complex economic entity where the households act as laborers, producers and consumers. For that case upon producing a quantity Q_p, the household consumes a portion of that quantity Q_c and the remaining difference (Q_p- Q_c) is sold at a certain market price P. In order to produce, the household requires several set of inputs, including labor which, hired at a certain fixed wage or rather use that available family labor or a mixture of both.

The total rice production will depend on a range of factors that include the household characteristics like resource endowment that include land, capital and labour. Whereas the consumption of the household will depend on characteristics related to the consumption of the commodity. Hence the marketed rice output is the gap between what has been produced with that which has been consumed. This is given below.

$$\boldsymbol{M_i = Q_P\left(p, W_I^P\right) - Q_c(p, [\alpha_i + f(p, W^p)], W_i^c) = f\left(p, \alpha_i, W_i^c, W_i^p\right) = f(X_i)}$$ **… … ..Equation 3. 1**

Where P is the price of the goodsW_i^p represents the factors affecting total production for a given household. W_i^c are the individual household characteristics that affect the consumption levels and M_i is the total output that is taken to the market for sale.

From this we can conclude that the extent of market participation is highly affected by exogenous factors that are affiliated to both consumption and production choices of the household.

3.2.3 Random Utility Model

Given the definition of market participation concept above, it is safe to say that commercialization process is a two stage activity where first the smallholder farmer decides to participate in the marketing of his/her agricultural products and after he has jumped that hurdle, then he decides on the extent of market participation by the total output he sells(be it in the output market) or the marketed input he uses (if it's in the input market). In all cases, the major driving factor for the choices of the smallholder crop farmer is to improve his/her welfare. For that matter, the random utility model is applied in order to discern the motives behind individual choices. For this case there are two choices that a smallholder farmer is faced with. The choice include to participation or not participating in the market. Let's say the two choices are denoted as M_P and M_{np} for market participation and non-participation respectively. Where the subsequent utilities to be realized from the two choices include U_p and U_{np} for participation and non-participation respectively(Greene, 2012).

Hence according to this theory the decision to participate in the market and the extent of market participation for the smallholder farmer will depend on the utility that he/she will obtain from the two choices. If utility realized from participation in the market is greater than that derived from non-participation ($U_p > U_{np}$) thenfor this case the smallholder will choose to participate in the marketing of his/her agricultural products and definitely the extent to market the products will be higher.

A common formulation of the linear random utility model is given as

$$\boldsymbol{U_p = X\beta_p + \varepsilon_p} \text{ … … … … … … … … ….Equation 3. 2}$$

$$\boldsymbol{U_{np} = X\beta_{np} + \varepsilon_{np}} \text{……..Equation 3. 3}$$

According to (Hofacker, 2011)this Random utility model formulation then considers the following assumptions for the random choice formulation as given by thurstone's law:

i) The choice to participate in the market or not to participate is a discrete event which implies an individual is either in or out.
ii) The utility derived from market participation or non-participation is reported to differ across different individuals as a random variable and
iii) The smallholder farmer is entitled to choose the option the offers him the highest level of utility(irrespective of how beneficial or non-beneficial that option may count to others).

Hence this takes us to the mathematical notations adapted from (Greene, 2012). From the above equations, Y_i= 1 is given as the observed probability of the smallholder choice to participate in the market, then this will result into the following equations:

$$\boldsymbol{Prob[Y_i = M_p] = Prob(U_{ip} \geq U_{inp} | X, \forall p \neq np) = Prob(\varepsilon_{ip} - \varepsilon_{inp} \leq X_{ip}\beta_p - X_{inp}\beta_{np} | X, \forall p \neq np}$$ **…..Equation 3. 4**

Where Y_i is the observed outcome for the ith observation; i= 1, … , … , …. , N representing smallholder households, p= 1, … , … , … , P and np= 1, … , … , …, NP are the alternatives under consideration and ε is a random error (Greene, 2012).

Another similar adaptation from (Lubungu, 2012) is clear that the difference of the utility level that is realized from the two choices ; market participation and non-participation is note observed hence with reference to the first assumption by (Hofacker, 2011) the choice of smallholder household is taken as a binary choice to be given as:

$$M_I \in p = \begin{cases} 1 if V > 0 \\ 0 otherwise \end{cases} \text{.....Equation 3. 5}$$

Where from the above equation V is given as the gap in the utility that is derived from the two alternatives for market participation and non-participation. So for that matter if the smallholders farmer decide to participate in the market for crop produce then this decision is assumed to depend on overall drivers and commercialization determinants as shown in the conceptual framework and other alternative attributes. Most of the alternatives attributes are un-observed, hence they are automatically in the random error term.

Therefore, the decision to choose market participation over non-participation is given by:

$$U_{ip} = X_{ip}\beta_p + \varepsilon_{ip} \text{.....Equation 3. 6}$$

Where X is a vector of observable explanatory variables, β represents a vector of parameters to be estimated and ε is a random error term assumed to be normally distributed (Greene, 2012).

The farmer makes these decisions sequentially ie he first has to choose to participate and then later on decide on the extent of participation. This then implies that if the household chooses to participate, then this is reflected in the total quantity of output (say farm produce) that he will take for sale in the market. The higher the quantity sold, the higher the outcome in terms of money and hence the higher the utility realized by the participating farmer compared to the one who did not participate.

3.2.4 Transaction cost theory

Transaction cost theory is a concept that was first introduced by (COASE, 1934) when he was discussing the nature of firms as institution. The author emphasizes that market exchange is not costless. New institutional economics defines transaction

costs as the cost incurred by an individual or a firm when it decides to participate in the market. Transaction cost can be divided into 3 broad categories that include bargaining costs, search and information costs and lastly policing and enforcement costs. The above mentioned costs are fixed transaction costs that are invariant with the quantity sold in the market. (Key, Sadoulet, & Janvry, 2000) defines the search and information cost as those that are incurred when searching for the sales person with the minimum price, while bargaining costs are those that are incurred when an agreement is sought. The authors further define proportional costs that are associated with inputs used for production purposes.

Several empirical studies have established that the increase in transaction costs significantly lowers market participation among smallholders firms. Hence the decision whether to commercialize or not, for most firms, is also highly influenced by the transaction costs associated with market participation(J. Jagwe, 2010). Hence the market participation decision is not only influenced by price and other characteristics such as quantity produced, but also transaction costs. This is because most farmers dwell in the rural remote areas. Access to town centers is highly impaired for most of the rural farmers. This then significantly increases the total transaction costs to be incurred(J. N. Jagwe, Development, & Sciences, 2011).

3.3 Commercialization

Commercialization (entailing market orientation and market participation) goes a long way into linking the input and output markets where farmers make these simultaneous decisions with the main aim of maximizing profits (Pingali LP, 1995) Commercialization refers to a complex process where farmers make decisions about their participation in the input and output markets for their agricultural produce. With

market orientation, farmers make informed decisions to change their agriculture production decisions in order to get along with the market signals like increased demand for their output and increased crop prices. This is especially when they realize that they stand a chance to make profit. Where market participation refers to when the smallholder farmers specifically produce surplus of agriculture produce with a careful use of purchased inputs in order to sell in the market(Berhanu,Gerbremedhin; Moti, 2010).

A lot has been written about the drivers to commercialization especially among smallholder rural farming households for the case of developing countries. Most literature emphasize on the external and internal drivers. With external drivers; (Von Braun, 1995) suggests that persistent population growth and changes in demographical composition, institution development of markets and infrastructure systems, progress in the non-farm sector influence of macroeconomic, trade and sector policies. In addition to these, there are several internal factors. Such include agro climatic conditions and risks, household characteristics like endowment of human capital, land and other productive assets, access to marketing avenues and good supporting infrastructure, supportive laws and legal system, cultural and consumption choices to mention a few (Pender & Alemu, 2007).

Commercialization can take up various forms for both food (cereals like maize, rice and millet) and non-food (coffee and tea) crops where the farmer may decide to sale the excess of their farm produce. This is because a handsome number of smallholders depend on farming and most of them produce staple food. Hence commercialization could entail producing food crops and selling the surplus, also it could entail a diversified option for both food and non-food crops and lastly

smallholder could only specialize on non-food crops(Berhanu,Gerbremedhin; Moti, 2010).

Defining commercialization, it is in three major dimensions. First, it can occur when the household participate in the output market for their produce. This is measured by the HCI (Household commercialization index) which is given by the following formulae ie

HCI = Gross value of all crop sales/Gross value of all crop production *100%

Where a zero value for the HCI indicate that the household is fully subsistence meaning that the crop being produced is totally devoted to the household's consumption. While a value of 100% implies that the household is totally commercial oriented means that all the crop harvested is marketed in order to obtain cash returns(Gebre-ab & Commercialization, n.d.; Leavy, Poulton, & Poulton, 2008)

The second measure as given by (Pender & Alemu, 2007) could consider the extent of participation in the input market. Decisions for smallholders to turn to agriculture commercialization will definitely push them to change their reliance on own-produced inputs and services like home-made manure and use of traditional seeds that were most likely retained form the previous harvest season. This will force them to depend on inputs markets to supply both their required inputs and subsequent services like improved seeds, inorganic fertilizers, pesticides and mechanized equipment for several farm activities like plugging , harvesting etc. Hence the required index known as HICI(Household Input Commercialization Index). It is computed as:

HICI=Total value of inputs bought from market/Total agriculture production value

Lastly, in other times hired labor indicates some level of commercialization. This is because one of the household has decide to engage in production for surplus, then they will definitely require more labor mostly hired labor, to compensate for extra production. This implies that the family labor now would act as a managerial level only, particularly overseeing the whole production process and smooth running of the enterprise. This could also lead to households members to look for other off farm activities that would bring extra income into the families. This has a good reflection of the households division of labor and decision making arrangements(Leavy et al., 2008; Pender & Alemu, 2007)

There are several advantages and disadvantages that come with smallholder commercialization. These are both at household and societal level. At the household level there is increased productionof the crops. Commercialization also provides an avenue to increase the household's income by the household participating in the market and also earning from labor if they work as hired workers in other peoples farms. There is increased evidence on the improved consumption diversity of the household hence improving on the nutrition welfare of the members. Furthermore, once the household realizes cash benefits from market participation, then they could use it to improve their food intake by diversifying it for a more balanced diet(Carletto, Corral, & Guelfi, 2017; Olwande & Mathenge, 2012).

Further (Zhou, Minde, & Mtigwe, 2013) records that at societal level, market participation is likely to result into food security, since there is substantial increase in the total production, there is also poverty alleviation since most smallholder farmers, who are rural dwellers are still in utter poverty hence marketing of their excess production will definitely take them out of poverty trap(Olwande & Mathenge,

2012). Market participation will also foster input and output market linkages, provide rural and urban employment opportunities due to the complex link of the activities that would result into crop production for both the input and output markets. It will further result into enhanced living conditions and social status of the participants and ultimately resulting into economic growth through investment and production endeavors.

For that matter then, the road to commercialization is characterized by several features where it can be grouped into major three stages. The table 3.1 below summarizes these levels into; subsistence system where the farmers consume the whole produce, semi-commercial system where there is a mix for both tradable and non-tradable productions and lastly the highest level where it is totally for trading purposes (Pender & Alemu, 2007).

Table 3.1: Definition of commercialization levels

Level of Market Orientation	***Farmer's objective***	***Sources of inputs***	***Product mix***	***Household income sources***
Subsistence System	Food self-sufficiency	Household generated (non-traded)	Wide range	Predominantly agriculture
Semi-commercial system	Surplus generation	Mix of traders and non-traded inputs	Moderately specialized	Agricultural and non-agricultural
Commercial systems	Profit maximization	Predominantly traded inputs	Highly specialized	Predominantly non-agricultural

Source from:(Pender & Alemu, 2007)

3.4 Empirical Literature

This section gives a detailed discussion of the empirical literature review of past studies that have been conducted on smallholders' behavior in market participation and market orientation. In line with this, the reviewed literature gives detailed elaborations on how the two decisions are sequential and each carries equal weight in the determination of the final outcome.

3.4.1 Empirical literature on determinants of market participation

(Ele, Omini, & Adinya, 2013) using primary data that was collected from 120 households of three different agricultural zones of Cross River State Nigeria, tries to identify the extent of commercialization in grain production among smallholder farmers. He found out that levels of commercialization in the study area are moderately high; about 60 percent. In order to identify the micro level determinants of commercialization, the study applied a tobit regression analysis where total product, access to extension services, family size, cultivated farm size, farming experience of the household head and being a member in a certain association significantly affected the level and extent of commercialization for household in the three agricultural zones.The author argues that a large family size could be a main ingredient to commercialize since the larger the household size, the more the labor supplied for farm work and hence increased agricultural harvests.(Olwande & Mathenge, 2012)who conducted a study among the rural poor households in Kenya, found out that large households are more reluctant to selling their produce in the market, this could be because most of it is actually used for home consumption and hardly a substantial amount is left for sale.

These findings are consistent with another similar study that was conducted in West Africa by (Martey, Kuwornu, et al. 2012) while using primary data collected from 250 households from twelve farming community in Effutu Municipality in Ghana and secondary data from Ministry of Food and Agriculture (MOFA) of Ghana analyzes the trend of production and commercialization of maize and cassava crops. The study employs a tobit regression analysis to report that the extent of commercialization for maize is about 0.53 and that for cassava is reported as 0.72, while the total commercialization for the two is reported as approximately 0.66. They find out that farm size, distance to the market and access to market information , output price and households with access to extension services determine the extent of market participation for household who are engaged in growing maize and cassava in Effutu Municipality.

Another study that was conducted by (Olwande & Mathenge, 2012) using 1275 households form three year panel household data from 2000, 2004 and 2007 was set to determine the extent of commercialization among the rural poor households in Kenya. The study employs a double hurdle model. The study makes analytical comparison of the rural poor and non-poor households to find out that the poor households generally have lower levels of market participation as compared to their non-poor counterparts. The study establishes that small farm sizes, low levels of production, limited credit access, low literacy levels and insufficient asset values are the factors that significantly influence the decision and the extent of market participation among rural households.

Another study conducted by (Moono, 2015a) compliments the findings above. The author was seeking to analyze the factors that affect market participation among

smallholder rice farmers in western province, Zambia. The data employs secondary data from a survey that was conducted in 2013. The study selects 390 smallholder rice producers. Using heckman two stage econometric model to identify both the factors that affect decision and the extent of market participation, he finds out that the household that owned assets, access to market information about prices, the total quantity harvested and the price of the rice significantly increased the extent of market participation of the smallholder rice farmers.

(Achandi & Mujawamariya, 2016) using a double hurdle model, looks into the determinants of market participation among rice farmers. He uses primary data that he has collected from few selected rice growing regions in Tanzania mainland. He looks first into the decision to participate in markets and also the extent of market participation. The decision to participate is seen as a stepwise activity whereby the farmer first has to cross one hurdle on choosing whether to participate or otherwise, upon which later on, he decided on how much to sell, that is the extent of participation. The decision to participate is seen to be influenced by the total yield realized, the type of seed that was planted and the distance the farmer has to travel to the market center. Furthermore, another study which employed a similar econometric approach(double hurdle model) , was conducted by (Mbegallo, 2016) to analyze the extent of market participation for four major crops in Tanzania mainland; maize, rice, beans and groundnuts. He observes a marked increase in market participation for all the selected food crops especially among the rural households. He reports that the factors that have resulted into this observation include farm size, adoption of improved seeds and the appropriate use of inorganic fertilizers, the total household size, the age and gender of the household head. All these were seen as important

determinants for the farmers decision to participate in the marketing of the crops mentioned above.

Another important study by (Mutabazi, Wiggins, & Mdoe, 2013) about market participation for smallholder farmers has been done in central Tanzania. The study used primary data that was collected from four villages; Ruaha Mbuyuni, Malolo, Lumuno and Msowero of Kilolo district Morogoro region. These villages produce onions for commercial sale. In able to identify the determinants of market participation, the study employs the use of tobit and Craig's(double hurdle model) models. He finds out that market propensity and the extent of market participation was higher for more diverse farmers. These are those farmers that cultivated food crops (including maize, rice and paddy) as well as onions. He realized that the age of the household head had a significant negative effect concerning market orientation aswell as market participation. Similarly, good access to road network, size of the cultivated land, possession of financial assets all had positive effect on the market participation for smallholder farmers. It was also noted that most of the onion was produced under irrigation scheme, and then the farmer's membership in water management associations enhanced participation and increased the scale of production. This is because most of these associations provided the needed platform for knowledge and information exchange.

Another study by (Mignouna, Abdoulaye, Alene, Akinola, & Manyong, 2015) was conducted in Nigeria and Ghana with the main aim of identifying the drivers of market participation decisions among smallholder farmers in yam growing areas. The study obtained primary data from 1400 households who were selected using a multistage random sampling procedure. The study used a double hurdle econometric

analysis to discern the factors that drive market participation. He found out that non-price constraint especially transaction costs were very significant in determining the smallholders decision to commercialize.

The findings are consistent with those from a similar study conducted by (J. Jagwe, 2010) who was looking at transaction costs and smallholder market participation in banana markets in Burundi, Rwanda and DRC. The study employs the use of secondary data with a total sample of 2666 households form banana producing areas of the three countries. A Heckman procedure was employed to discern the econometric significance of variable selected. The study clearly identified fixed transaction costs to mainly affect the decision to participate in the market, while proportional costs mainly affect the extent of market participation.

(Honja, 2017) investigates the determinants of intensity of market participation of smallholder mango producers in southern Ethiopia, where 138 smallholder mango producers were selected randomly. The study employed a tobit model to discern the factors that affect the intensity of market participation of smallholder mango producers. The study found out that post-harvest loss, household size, sex and access to non-farm income negatively influenced the intensity of market participation among smallholder farmers. These findings were consistent with those of a study conducted by (Martey, Kuwornu, Martey, Al-hassan, & Kuwornu, 2012) who also found out that the households with higher off-farm income are less likely to commercialize.

Several studies have investigated the influence of institutional factors such as the ability to access credit and extension services and how they determine market participation among smallholder farmers. For instance,(Okoruwa & Nkamleu,

2009)who seeks to identify the socioeconomic factors that affect the intensity of market participation among smallholder yam farmers in Nigeria. The study uses primary data that was collected from 240 farmers. The study employs a basic probit and tobit econometric model to identify the significant factors. The results of the study indicate that access to market information, access to credit services and contact with an extension agent among smallholder farmers significantly determined market participation.

(Abdullah et al., 2017) also conducts a study that aims to look into the determinants of commercialization and its impact on smallholder farmers. Using primary data collected from 249 rural rice farmers in most fertile regions of Pakistan, the author employs the heckman model to identify the determinants of household commercialization. The results report that gender of the household head his age, the total household size, the farmer being a landlord, the total number of family members who assist in the farm work and vocational training have a positive effect on market participation propensities. The study specifically argues that male heads households are more likely to commercialize compared to female headed households. This is contrary to what is reported by (Zamasiya, Mango, Nyikahadzoi, & Siziba, 2011) who finds out that female headed households are more likely to commercialize, compared to male headed households. However, most other studies conducted by (Mignouna et al. 2015; Moono 2015; Olwande and Mathenge 2012)have proved that the gender has no significant impact upon the decision for the household to participate in the market.

Studies have indicated that access to improved agricultural inputs and irrigation facilities have influence the intensity of market participation. (Sindi, 2008) uses data

of cross section survey data from 1997 to 2000 from 1540 rural households in Kenya.The study aim to establish the determinant of market participation for horticultural crops. The study usestobit, Heckman selection and double hurdle models to establish the determinants of market participation decisions. With the tobit model, the assumption is that the farmers decision to participate in the market is single but the other two models (heckman selection and double hurdle models) assume that the decision is stepwise where first the farmer chooses to participate ad later he chooses the extent of participation. The findings of the study reports that education level of the household head is insignificant on determining the total sales. Nevertheless, size of the household, age of the household head, size of the cultivated land, ability to irrigate and higher asset value were positive determinants in explaining the market participation of the horticultural crop farmers of rural smallholders in Kenya. Concerning the use improved inputs, (Zamasiya et al., 2011) finds out that the use of improved soy bean seed varieties positively affects the intensity of marker participation. In additional to that, a study conducted by (Mbegallo, 2016)reports that the adoption of inorganic fertilizer use and improved seeds for maize cultivation has significantly raised the production levels and hence market participation among rice farmers due to the surplus produce realized.

Studies have indicated the age of the household head influences the decision to participate in the market. (Musah, Bonsu, & Seini, 2014) conducts a study with the aim of identifying factors that affect commercialization among smallholder maize farmers in the upper west region of Ghana. The study used primary data collected from 200 households. He employs a double hurdle model to identify the factors that affect the decision and the extent of market participation. He finds out that age is

significantly but negatively related to both the decision and the extent of market participation. He argues that older households are keener about food security issues hence that makes them more reluctant to sell the extra output. This finding is consistent with what (Martey, Kuwornu, et al. 2012; Mutabazi, Wiggins, and Mdoe 2013; Sindi 2008) found. They conclude that younger household heads are the ones that are more likely to participate in marketing their output. This is mainly because they are risk takers since they highly take up opportunities to make profit out of them selling their produce in the market. However, other studies find no significant relationship between commercialization and age.

Contrary to that, (Ele et al., 2013) whose study was conducted in the Nigerian context, has education level measured as the level of farming experience that the farmer has in crop cultivation. Using 120 households across the different agricultural zones of cross river state, and a tobit analysis, he finds the variable, farming experience, is highly significant in determining the extent of market participation. This implies that household heads that have a long time practicing crop cultivation are likely to have more knowledge on production issues but furthermore they are likely to have accumulated more marketing experience and negotiation skills. Due to their experience, they could also have accumulated more customers and hence this could explain their high output sales.

Concerning asset ownership among the household, most empirical findings confirm that is positively related to decision and extent of market participation. Especially among rural households, the assets like livestock and farming tools have been reported to significantly increase the total agriculture productivity among small-scale rice farmers in Zambia (Moono, 2015a). In addition to that, most empirical studies

have also confirmed that the total land size under the households ownership significantly increase the extent of market participation among smallholder farmers (Olwande & Mathenge, 2012).

3.4.2 Empirical literature on the determinant of market orientation.

This subsection reviews empirical studies that were conducted with reference to the determinants of market orientation among smallholder farmers.

A study conducted by (Linus & Ezealaji, 2013) aimed to find out the factors that influence smallholder market orientation among cassava farmers in Nigeria. The study used household survey data that was collected from 100 households. Employing a tobit econometric model, the results of the study implies that market orientation is significantly affected by demographic characteristics of the household head. These characteristics include age, gender and the education level of the head of the household. While age negatively affects commercialization, education, gender and distance to the market affects market orientation positively.

(Osmani & Hossain, 2016) investigated smallholders market orientation and the factors that affect in among smallholder farmers in Bangladesh. The study uses primary data that was collected from 100 farmers in Rajshahi district. Using multiple regression analysis, the study finds out that 69% of the farmers are market oriented; this is because they sell their surplus output in the market. The study also finds out that market oriented farmers are highly characterized by large farm size, use of improved seed variety. Ina addition to that, they have access to extension services and have recorded a high total value of cash crop produced.

A distinguishing study by (Berhanu,Gerbremedhin; Moti, 2010)uses smallholder agriculture data from Ethiopia separately analyses the determinants of market

orientation and participation. The study further seeks to find out if market orientation really translates into market participation.Using a total of 164 farmers, the study employs a multiple regression econometric model to discern the factors that contributes to market orientation. Unlike (Osmani & Hossain, 2016), the study reports that only 29% of the smallholder farmers are market orientated. The study finds out that the total family size, the total labor supply, ownership of equine and the farmers' involvement in extension services, land fragmentation and distance to all weather road have significant influence on market orientation.While the total family size and distance to the market negatively influence market orientation, the total labour used, access to extension services and land fragmentation positively affect market orientation.

Furthermore, the study by (Berhanu,Gerbremedhin; Moti, 2010) extends empirical findings to show how market orientation translates into market participation. The study here employs a tobit regression analysis, with a total of 157 farmers to identify the factors that affect crop output commercialization. The results indicate that market orientation, the total output produced and distance to the nearest market significantly influence market participation. This is especially clear for market orientation because as the farmer becomes more market oriented, his total output sold is likely to increase by 128 kilograms.

3.5 Overview of the Literature and Research Gap

In summary, the empirical literature reviewed above clearly identifies classification of factors that affect the decision and the extent of market participation among smallholder farmers. The factors could be divided into major subdivision to include

demographic and socio-economic factors, agricultural inputs use, market access factors, institutional factors and market orientation.

Some of the issues recommended by most authors for the enhancement of market participation include: enacting policies that could reduce transaction costs that hinder small-scale farmers from selling their produce to the market. In addition to this, initiatives could be formulated in order to increase social capital through the provision of collective step of action among the rural poor households, who make the large proportion of smallholder farmers.

Although most of the studies that were conducted in developing countries' context express similar results as those conducted in Tanzania, most of them left out the main component of those factors that affects market participation: market orientation. Market orientation concept was mainly covered by (Berhanu,Gerbremedhin; Moti, 2010) in a study that was set to analyze the extent of market participation among Ethiopian small-scale farmers. Most other studies have failed to look into the effect of market orientation upon market participation decisions and market sales extent among smallholder farmers.

Hence this study, employing up to date national representative data from Tanzania, will incorporate the variable in its model specifications in order to establish how market orientation index affects the decision and the extent of market participation among smallholder rice farmers in Tanzania.

3.6 Study Contribution to the existing literature

The study focuses on the factors that determine smallholder market participation decision and extent for smallholder rice farmers in Tanzania. This study mainly uses National Panel Survey data for 2014/2015 which is a countrywide representative

data. The study mainly contributes to other similar studies that were conducted in the world with regard to determinants for both market orientation and participation.

The major contribution of this study is the fact that very few writings have included market orientation index as a determinant of the extent of market participation. Most studies have only considered the decision of the household to participate or otherwise, but they have not looked into how market orientation translates into market participation.

Hence this study contributes to literature by not only showing the determinants of market orientation, but also it shows how market orientation as an explanatory variable contributes to increasing the quantity of rice output sold in the market.

3.7 Conclusion

This chapter clearly explores both the theoretical and empirical literature that is related to the decision to participate in the market and the intensity of participation thereafter among smallholder farmers. Most literature reviewed reveal that the two decisions are sequential where the decision whether to participate or not is made first, then the intensity of participation after. Most of the empirical studies reveal that the decision to participate is mainly affected by non-price factors and household socio-economic characteristics, while the intensity of market participation is mainly determined by other production related factors such as the total harvest, the size of land used and other market transaction costs like transportation costs. There are numerous studies that have been carried out in the African context but most leave out the contribution of market orientation to the extent of sales among smallholder farmers. Both market participation decision and intensity are highly affected by the household's response to market signals; market orientation. Hence this study intends

to fill in this literature gap where market orientation index will be computed and separately used to verify whether the smallholder farmers are indeed market oriented and if this consequently affects the decision and extent of market participation respectively.

CHAPTER FOUR

STUDY METHODOLOGY

4.1 Introduction

In this chapter of the study, a detailed discussion of the study methodology is presented. The data and sample selection is well presented first followed closely by the theoretical framework that has been employed. Then afterwards there is a discussion of variable specification and the methods of analysis that would be used to establish the relationship between the dependent and independent variables.

4.2 Data Type and Sources

The study uses a cross section data from National Panel survey the fourth wave that was collected in 2015. The data was gathered by the National Bureau of Statistics. The survey covered approximately 3352 households from 26 regions in Tanzania both rural and urban areas. The study will only use one wave because it's the most current of the data available where by most of the interventions have been undertaken as compared to the other former waves. The survey collected information on 4 major areas that included household, agriculture, livestock and community questionnaire. However for the purpose of this study, only household and agriculture sections of the survey data have been considered for analysis. This is mainly so as to capture household social, economic and demographic characteristics and the household agriculture decision and outcomes simultaneously. Since this study focuses on rice smallholder farmers and their market participation activities, the data was collapsed in order to capture the respondents as the household heads. The primary reason as to why the household head characteristics alone were considered is

because they are those whose decision is taken as a representative for the choice that would have been made by individual family members of the farming household.

The study majorly focuses on rice production and marketing, so this data was again collapsed to capture only those households which participated in rice cultivation, harvested and maybe sold some of the rice output for the agricultural period under consideration. Hence for that matter this reduces the total sample size to be 352 households.

The survey was carried out in the whole country and thus making the sample of rice farmers captured to be a national representation. The data used is only from the fourth wave of the National Panel Survey data, hence the findings are attributable to the period that is covered by the data set in use.

4.3 Theoretical Framework

A simple agricultural household model has been developed to analyze market participation as a choice variable. The household has to decide how much of good i to consume (C_i) that is from market-purchased staples, home-produced staples and other market purchased commodities and services. It also decides how much to produce (Q_i) and use of input such as labour and other forms of production units such as animal traction (X_i). The production of rice is a function of services provided by resources under the household ownership (labor), the private sector(transport services), public sector(extension services) and assets owned by the household(eg oxen and other form of land tilling mechanizations). In addition to that, the household also decides how much of each good to sell (M_i).

When the farming household sells any amount of output it produces, M_i assumes a positive value. Otherwise, when the household purchases such goods, M_i assumes a

negative sign. Under the assumptions that there are no transaction costs, the household's problem would be to maximize utility U subject to a set of constraints namely; cash constraint, resource availability and production function.

Given the market determined prices p_i^*, the household model can be written as;

Max$U(C, Z_u)$ … … … … … … … … …Equation 4. 1

Subject to

$\sum_{i=1}^{N} \boldsymbol{P_i^m} + \boldsymbol{T} = \boldsymbol{0}$ … … … … … … … … .. **Equation 4. 2**

$\boldsymbol{Q_i - X_i + A_i - M_i - C_i = 0}$**……Equation 4. 3**

$\boldsymbol{K(Q, X; Z_q) = 0}$ … … … … … … … … … … … ….**Equation 4. 4**

$\boldsymbol{C_i, Q_i, X_i \geq 0}$ … … … … … … … … … … … …**Equation 4. 5**

Where P_i^m is the market price of good i, A_i is an endowment in good i, T is the exogenous and other income, Z_q and Z_u are exogenous shifters in production and utility respectively. K is the production technology that is employed. The equation 4.2 above is the cash constraint that implies the expenditure of the farming household shouldn't exceed revenue and transfers. The resource balance constraint (equation 4.3) implies that for each of the N goods, the quantity sold, the used and input and the quantity consumed should be equal to the sum of the quantity purchased and produced, in addition to the total household endowment. Then there is the production technology (equation 4.4) that relates inputs to outputs.

Transaction costs can significantly influence the decision of the household to participate in the market for goods and services. The transaction costs include both the proportional transaction costs and fixed transaction costs. Inclusion of the proportional transaction cost(PTC) t_{pi}^b, such like marketing and transportation costs,

this significantly increases the price paid by buyers and reduces the price received by producer. This then results into the new cash constraint given below.

$$\sum_{i=1}^{N}\left[\left(P_i^m - t_{pi}^s(Z_t^s)\right)\delta_i^s + \left(P_i^m + t_{pi}^b(Z_t^b)\right)\delta_i^b\right] + T = 0 \quad \text{... ...Equation 4. 6}$$

Where b represents buyers, s represents sellers and P is the price level for the crop. The parameter δ_i^s and δ_i^brepresents the cost shifter. The farmer pays fixed cost t_{fi}^s if it sells good i and pays t_{fi}^b if it buys good i.Recall that t represents total cost, f is the fixed cost for good i and b is the farmer buys while s if the farmers sells

In the case where fixed transaction costs are included into the model, then we have the cash constraint as given below.

$$\sum_{i=1}^{N}\left[\left(P_i^m - t_{pi}^s(Z_t^s)\right)\delta_i^s + \left(P_i^m + t_{pi}^b(Z_t^b)\right)\delta_i^b\right]m_i - \left[t_{fi}^s(Z_t^s)\delta_i^s - t_{fi}^b(Z_t^b)\delta_i^b\right] + T = 0 \quad \text{.....Equation 4. 7}$$

For the scenario where the household incurs both fixed cost of t_{fi}^b if they buy and t_{fi}^s if they sell.The above cash constraint inculcates both fixed and proportional transaction costs. In order to derive the supply and demand equations for the farming household that is facing both fixed and proportional transactional costs, a langrangian expression is used for equation 4.1 to 4.7 (Moono, 2015b).

Inculcating the transaction costs into the supply curves for selling, buying and those in autarkic is given as follows:

$$q^s = q\left(p^m - t_p^s - t_f^s, Z_q\right) \quad \textbf{for sellers}\text{.....Equation 4. 8}$$

$$q^b = q\left(p^m + t_p^b + t_f^b, Z_q\right) \quad \textbf{for buyers}\text{.....Equation 4. 9}$$

$$q^a = q\left(p, Z_q\right) \quad \textbf{for autarkic households}\text{.....Equation 4. 10}$$

According to (J. Jagwe, 2010) for empirical analysis, we focus on the selling household where a linear expression is assumed for the supply function. The linear expression is given as below:

$$\boldsymbol{q(p, Z_q) = p\beta + Z_q\beta_p - t_p^b} \text{ … … … … … … … … … … … … … … … … … … …Equation 4. 11}$$

Whereby,

$t_p^s = -Z_t^s\beta_p^s$ and $t_p^b = -Z_t^b\beta_p^b$.

This then leads us to a linear expression for sellers as given below

$$\boldsymbol{q^{s*} = p_m\beta_m + Z_t^s\beta_t^s + Z_q\beta_q} \text{ … … … … … … … … … … … … … … … … … … …Equation 4. 12}$$

The linear expression for production threshold levels is thus given as shown;

$$\boldsymbol{q^s = Z_s^t\alpha_t^s + Z_t^s\alpha_t^s + Z_c\alpha_c^s} \text{ … … … … … … … … … … … … … … … … … … ….Equation 4. 13}$$

Where Z_t are exogenous characteristics like distance to the market and extension service costs that affect transaction cost when selling, Z_q are given as production shifters, Z_c are assumptions shifters and α_t^s, α_c^s are the coefficients respectively.

Furthermore, β_q, β_t^s are coefficients of Z_q and Z_t^s respectively. Where $q^{s*}$is a latent supply if the farming household is a seller and observed if it is higher than a threshold for market participationq^s. Thus if the total q^{s*}>q^s then the household is participating in the market as a seller. And the parameter can be identified using a probit model.

$$\boldsymbol{q^{s*} > q^s \equiv prob(y = 1) = X_i + u} \text{ … … … … … … … … … … … … … … …Equation 4. 14}$$

While the estimation of parameter $\beta_{q,}\beta_t^s$ and β_m cover for the intensity of market participation among sellers.

The likelihood of not commercializing is given by;

$$\boldsymbol{\emptyset\left(-\frac{X_{1i}}{\sigma}\right) + \emptyset(-X_{2i}\gamma)\emptyset\left(\frac{X_{1i}\beta}{\sigma}\right)} \text{ … … … … … … … … … … … … … … … ….Equation 4. 15}$$

And the likelihood for observing positive amounts of sales is given as:

$$\boldsymbol{\emptyset(X_{2i}\gamma)\sigma^{-1}\emptyset\left(y_i - \frac{X_i\beta}{\sigma}\right)} \text{ … … … … … … … … … … … … … … … …Equation 4. 16}$$

The log likelihood function of a double hurdle model is

$$\boldsymbol{lnL = \sum_{O} ln\left\{1 - \emptyset(X_{2i}\gamma)\emptyset(\frac{X_{2i}\beta}{\sigma})\right\} - \left(\frac{n}{2}\right) ln\sigma^{2} + \sum_{+} ln\emptyset(X_{2i}\,\gamma) + \sum ln\emptyset\left\{\frac{(y_i - X_{1i}\beta)}{\sigma}\right\}} \text{ … … … … ….Equation 4. 17}$$

In addition to this, objective 1.1 and 1.2 of the study, which try to look into the factors affecting market orientation propensities is analyzed by the use of a tobit model. Recall that the data on market orientation is censored where it ranges from a value zero to one. In order to identify the factors affecting market orientation tendencies neither OLS, probit or logit model will work. But rather, Tobit Model that uses maximum likelihood regression (MLE) estimation is most appropriate. Hence using this type of model to determine the factors affecting market orientation while controlling for other factors is expressed as:

$$\boldsymbol{Y* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \mu_i} \text{ … … ..Equation 4. 18}$$

$$\boldsymbol{Y = 0\ if\ y \leq 0}, \text{ … … … … … … …Equation 4. 19}$$

$$\boldsymbol{Y = Y^{*}\ if\ y > 0} \text{ … … … … ….Equation 4. 20}$$

Where

Y*=Market orientation Index

β=estimated coefficient

X=the explanatory variables

μ_i=error term (normally distributed)

The dependent variable Y equal 0 if the latent variable is below a certain threshold (zero). If values of latent variable are positive, then the dependent variable is equal to the latent variable

$$y^* = \beta_0 + X\beta_1 + \mu \text{ … … … ..Equation 4. 21}$$

y^*=max (0,y^*)

……..Equation 4. 22

Where the latent variable y* satisfies the classical linear model assumptions. The equation above implies that:

$$p(y = 0|x) = p(y^* < 0|x) = p(\mu < -x\beta) = p(\mu|\sigma < -x\beta|\sigma) = \emptyset\left(-\frac{x\beta}{\sigma}\right) =$$

$$1 - \emptyset(\frac{x\beta}{\sigma})\text{Equation 4. 23}$$

Since μ/σ has a standard normal distribution and is independent of x; we have absorbed the intercept into x for notational simplicity. Therefore if (x_i, y_i) is a random draw from the population, the density of y_i given x_i is

$$(2\pi^2)^{-0.5exp\left[-\frac{(y-x\beta)^2}{2\sigma^2)}\right]} = (1/\sigma)\emptyset\left[\frac{(y-x_i\beta)}{\sigma}\right], y > 0 \text{ … … } Equation\text{4. 24}$$

$$p(y_i = \sigma/x_i) = 1 - \emptyset(x_i\beta/\sigma)\text{……..Equation 4. 25}$$

Where ø is the standard normal density function hence from the above equation the log likelihood function for each i is given by

$$l_i(\beta, 0) = 1(y_i = 0)log\left[1 - \emptyset\left(x_{i\beta}/\sigma\right)\right] + 1(y_i > 0)log\left\{(\frac{1}{\sigma})\emptyset[(y_i - x_i\beta)/\sigma]\right\} \text{ … … …Equation 4. 26}$$

Therefore the maximum likelihood estimates of β are obtained from STATA.

4.4 The Econometric Specification

Numerous studies that have seek to establish the underlying factors for smallholder market participation have modeled this decision as a two-step decision(Berhanu,Gerbremedhin; Moti, 2010; Mbegallo, 2016; Mutabazi et al., 2013; Olwande & Mathenge, 2012; Sindi, 2008) while some few others have taken in to be a single decision(Martey, Kuwornu, et al., 2012).

As in most cases for rural smallholder farmers, they are semi- commercialized; hence they could decide to hold back all the harvest realized for home consumption. In other case, they could decide to sell the surplus. The zero values for the non-traders could be taken as the household crop ownership decision while the rest of the farmers have chosen to participate in the market. (Martey, Kuwornu, et al., 2012) who assumes that the decision to participate and the extent of participation is made together, uses the standard tobit model to deal with the resulting data that has many zero outcomes resulting into a censored dependent outcome. Although it seems simplified, the major implication of using the standard tobit model is that the factors that affect market participation choice and the quantity decision are one and the same, affecting the endogenous variable in a similar manner. Further, the model takes it that the fixed costs that are affiliated to market participation affect the smallholders decision to participate in the market.

Recall that t represents total cost, f is the fixed cost for good i and b is the farmer buys while s if the farmers sells the factors that have influenced market participation. This model is used when the household is assumed to make sequential decisions where first they decide to participate in the market and then the extent of market participation afterwards. With this model, the major assumption is that the zero

values were majorly observed due to the household's self-selection where the farmer deliberately chooses not to sell hence the value zero. This model account for the non-randomness of the sample due to the fact that self-selection is almost inevitable. It corrects for the problem by finding the selection term from the first equation by using the full sample probit model where this is followed by incidental truncation estimation for the selected subsample. The selection term is included in the second equation as a regressor where it corrects the self-selection problem that was in the sub sample(Verbeek, 2004; Jeffrey M. Wooldridge, 2010).

With the heckman model, the variable S_i is an indicator variable that is equal to units for the household that sold rice, ϕ is the standard normal cumulative distribution function and X_i is a vector of factors that affect market participation as shown in the table. The vector of coeffients to be estimated is represented by β and $\mu_i$is the error term that is assumed to be normally distributed with a mean zero and a variance σ^2.

$$\boldsymbol{Pr(S_i = 1|X_{i,}\beta)\emptyset(h(X_i,\beta)) + \mu_i} \text{ ... ...} \textbf{Equation 4. 27}$$

The variable S_i takes the value 1 if the marginal utility the household gets from participating is greater than zero and 0 otherwise as shown below.

$$\boldsymbol{S_i^*=\alpha X_i + v_i} \text{ ... ...} \textbf{Equation 4. 28}$$

Where S^* is the latent variable of utility that the household gets from participating in the rice market and the error term μ_i is assumed to be $\mu_i \sim (N,1)$ as so, we have

$$\boldsymbol{S_i = 1 \ if \ S_i^*>0} \text{.....} \textbf{Equation 4. 29}$$

$$\boldsymbol{S_i = 0 \ if \ S_i^* \leq 0} \text{ ... ...} \textbf{Equation 4. 30}$$

The second stage employs a regression model.

$$\boldsymbol{SOLD_i = W_i\beta + \varepsilon_i} \text{.....} \textbf{Equation 4. 31}$$

The regression model yields biased results when using OLS because the error term of the probit model and the regression model are correlated i.e.$(\varepsilon, \mu) = \rho$. To correct for this bias, an inverse mills ratio is introduced in the regression model as an explanatory variable.

$$\boldsymbol{E(y_i|Z_i\gamma > 0) = X_i\beta + \rho\delta_\varepsilon\lambda_i} \text{ … … … … … … … … … … … … …Equation 4. 32}$$

Where X_i explanatory variable that determines market intensity after correction of bias, β is a vector of co-efficient,$\delta_\varepsilon$and δ_μ are standard errors for the random terms for regression and selection model respectively.

$$\lambda_i = \phi\left(\frac{Z_i\gamma}{\delta\mu}\right) / \emptyset\left(\frac{Z_i\gamma}{\delta\mu}\right)$$

Where ϕ and $\emptyset$ represents the standard normal cumulative distribution function and standard normal distribution respectively.

A better improvement of the two would be to use a double hurdle model, also known as a two tier model. This model also assumes that the household has to make two decisions where first it has to cross the hurdle of deciding to participate or not. Then the household will choose on the extent of participation. Several studies that have applied this model have followed in the major assumption of the model that the factors that affect the first decision are totaly different from those that affect the second decision. The additional advantage of the model is that one same determinant is allowed to influence both decisions (to participate and the extent of participation) in a different way(Je M Wooldridge, 2002)

This double hurdle model is a type of a corner solution outcome model. Similarly like other models, this one defines the initial discrete probability of market participation where the initial decision to participate is given by$(y > 0\ vs y = 0)$.

Then conditional upon participation i.e.$(y > 0)$ a second decision is made on the extent of participation ie how much quantity of y to be sold to the market.

The first hurdle to cross can be expressed as:

$$\boldsymbol{y_i = 1\ if y_i^* > 0\ and\ 0\ if y_i^* \leq 0} \text{ … … … … … ….Equation 4. 33}$$

$$\boldsymbol{Y^* = (X'\alpha + \varepsilon_i)} \text{……Equation 4. 34}$$

Where y_i^* is the latent participation variable if it takes a value 1 then the smallholder household participates in the market and if 0 then they don't participate. X represents a vector of household characteristics and α is parameter and ε_i is a random error term.

The second hurdle, like a tobit model is expressed as:

$$\boldsymbol{M_i = M_i^* > 0\ and y_i^* <= 0} \text{ … … … … … … … … … … … … … … …Equation 4. 35}$$

$$M_i = 1\ otherwise$$

$$\boldsymbol{M^* = Z_i'\beta + \mu_i} \text{ …. Equation 4. 36}$$

Where M_i is observed response on how much crop output to be sold to the market, Z is a vector of explanatory variable and β is a vector of parameters. The first hurdle is estimated using a standard probit model while the second hurdle is estimated using a truncated tobit model.

4.5 Variable Specification and Measurement

The various variables that will be used will be divided into categories: The socio-economic household characteristics, household resource endowment, access to market and transaction costs and institutional services. Several studies have made use of these variables(Berhanu,Gerbremedhin; Moti, 2010; Ele et al., 2013; Martey, Annin, et al., 2012; Martey, Kuwornu, et al., 2012; Mignouna et al., 2015; Mutabazi et al., 2013; Olwande & Mathenge, 2012; Pingali, Khwaja, & Meijer, 2005)

4.5.2 Dependent Variable

MARKET_PARTICIPATION: This is the firstbinary dependent variable which will capture market participation. The variable takes a value of 1 if the individual reports to have sold any rice produce in the market and 0 otherwise.

QNTY_SOLD: This is a continuous variable that represents the total amount of output that was sold in the market. It is mainly used to capture the intensity of market participation among farmer household.

4.5.2 Independent Variable

Household Commercialization index (HCI)

The independent variable will be the HCI also household commercialization index which measures the total amount of household crop sales against the total output produced. This is given as:

$$\boldsymbol{HCI_i = Cropsales_{ij}/Totalcropproduction}$$

$$\boldsymbol{HCI_i = \frac{\sum_{j=1}^{m} QTY_{SOLD\,ij}}{\sum_{j=1}^{m} HARVST_{QTY\,ij}} * 100\%} \text{ … … … … … … … … … … … … … …Equation 4. 37}$$

$i = 1,2,3 \ldots, n; j = 1,2,3 \ldots, m$ and $0 \leq HCI \leq 1$where i is the household and j represents the crop, for this case rice.

Where the index will be used as a continuous variable with a minimum 0 and maximum of 100%.

Household characteristics

AGE: This is a continuous variable resenting the age of the head of the household. It could affect market participation either positively or negatively. It could be that younger household heads could be more innovative and informed about the possible advantages of commercialization hence this could increase their chances. All the

same older household heads could be more experienced about market trends and patterns and having that, they could earn more from market participation.

GENDER: This represents the sex of the household head. It is binary in that 1 represents a male headed household while 0 represents a female headed household. The gender of the household is expected to have an influence on the decision to participate in the market. Male headed household are expected to have a higher propensity to participate compared to females. Males are considered more vigilant and willing to take up risks compared to female who fear for the food security of the members.

EDUCATION_D: This represents the education level of the household head. It is a dummy variable that is represented by three levels of education. There is *PRIMARY_D*, *SECONDARY_D* and *TERTIARY_D*. The three categorization are meant to capture the effect of the level of education of the household head on their decision to participate in the market. This too has ambiguous effects on the decision to commercialize First it is expected to enhance the household decision making process with regards to market dynamics like when to sell. Also an educated household is likely to know more about input usage and the consequent of output sales. In addition to that, they are likely to be endowed with better business and managerial skills that will equip them for the commercialization process. Similarly education tends to increase the chances of an individual securing a decent job hence lowering the chances of engaging in commercial agriculture

HHSIZE: This is a continuous variable that is expected to have an ambiguous nature. This is because it will be expected to have a negative effect on the market participation this is because most of the output produced will likely have more

consumption choices as compared to smaller households. Similarly, largesize of the household also indicates availability of labor and hence affecting the total output to be produced because cultivation of rice is labor intensive.

MARITAL_STATUS: This is an independent variable that represents the marital status of the head of the household. The variable takes the value 1 if the household head is married and 0 otherwise.

Household Resource Endowment

MARKET_ORIENT: This is used both as a dependent and independent variable. This is defined as the state where the household is responding to market signals when making decisions about market participation. This index is computed as below

$$MOI = HCI * \frac{Area\_harvested}{total\ land\ available}$$

$$\boldsymbol{MOI_i = \frac{\sum_{j=1}^{j} HCI_j \times L_{ji}}{L_i^T}\ ;\ L_i^T > 0\ and\ 0 < MOI_i \leq 1} \text{ … … … … … … …Equation 4. 38}$$

Where i represent the household and j is the crop produced (rice for this case).

This is indicative of the response to market signals by the household mainly because the higher the amount of land the household allocates to a certain crop, then the more market oriented is that household towards that crop.

HIRED_D: This is abinary variable that captures the household's decision to hire labor for more production. The variable takes a value 1 if the household hired any labor and 0 otherwise. The hiring of labor for production would result into more production and hence encourage the decision to participate in the market and even selling more of the produce.

MECHANIZATION_D: This is binary variable that captures the household use of any farming equipment like hand hoe, tractor and the like during the planting

process. The use of modernized farming equipment is likely to result into more land cultivated and hence higher productivity. But the use of traditional farming instruments like hand hoe will likely to result to lower output and hence affect the decision to sell the output.

HHASSET_D: This is a set of binary variables that represents the household ownership of radio, television and mobile phone (RADIO_D, TELEVISION_D and MOBILE_D). These assets are taken in as a measure of the ability of the household to obtain information about possible market areas and the consequent response to the market information by the household in question. It is expected that the households that possess at least one of the above mentioned asset are likely to sell more compared to those who have none.

WEALTH_INDEX: This is a continuous variable that represents a wealth measure for the household. It was calculated by the use of PCA method. It represents the total wealth that a household is endowed with.

AREA_HARVEST: This is a continuous variable that represents the total area harvested. It will be used as a proxy of the total land size that is possessed by the household. The higher the area harvested, then the higher the output realized and consequently the amount sold out to the market.

LAND_FRAGMENTATION INDEX: This is a continuous variable that shows how the land available is for cultivation. This index is calculated by dividing the land cultivated by rice by the total area accessible.

$$LFI_i = \frac{Total\ land\ allocated\ for\ rice_j}{Total\ land\ accesible\ to\ the\ farmer_i}$$

$j = 1,2,3, \ldots$ n where j represents the households that have cultivated rice.

LAND_ACCESS: This is a continuous variable that represents the total land area that the household is able to access for use at that time. This variable is important as it shows the total area that the household can allocate to various uses. The choice of the land use will depict the value that the household attaches to that function.

HARVEST_QTY: This is a continuous independent variable that represents the total harvest realized by the household. It is measured in kilograms. It's expected to positively impact both the decision and the extent of market participation.

Access to markets and transaction cost

DISTANCE_MKT: This is a continuous variable that measures the total distance from the household resident to the market place.

Institutional services

EXTENSION_D: This represents a set of variables that is a proxy measure of the formal source of agriculture production and market access information. This is a binary variable taking a value 1 if the household received any extension service for both production and marketing and 0 otherwise. This is because the extension agents are responsible for the transfer of technology that has been carefully developed by research. This serves as expected to impact positively on total output produced and the decision to participate in the market.

VOUCHER_D: This is an independent binary variable that takes a value 1 if the household received any of the input for this case the seeds used by a voucher system and 0 otherwise.

Agriculture practices

SEED_VARIETY: This is a binary independent variable that takes the value 1 if the household used improved seed variety and the value 0 otherwise. The household that

uses improved seed variety is likely to realize higher rice harvest due to the fact these improved seeds have superior properties compared to traditional seeds. Hence there is expected a positive relationship between use of improved seed variety and increased production hence increased market participation.

Otherwise, some household still use traditional seeds in their planting. This could attribute to them receiving lower harvests and hence lower market participation.

INORGANIC_D: This independent dummy variable is used to capture the use of inorganic fertilizer among rice farmers. There is expected to be a positive relationship between the use of inorganic fertilizer and the consequent output produced. Hence the more fertilizer used, the higher the harvest and possibly the more output sold in the market by the farmer.

PREHARVEST_LOSS: This is a independent variable that is in form of a binary variable that takes the value 1 if the household incurred any loss before the harvest and 0 otherwise. This is meant to capture the possibility of such a loss affecting the decision and extent of market participation for the household.

4.6 Description of the Model and Model Specification

Given the nature of the study data and objectives, the data analysis will be divided into three models that will capture market orientation and market participation decision and intensity.

The first model to be used is given where market orientation is the dependent variable. This is an index that is calculated as shown above. In order to study the extent of market orientation among households, the following linear model is estimated;

$$MOI = \beta_0 + \beta_1 HH + \beta_2 AGRI_{INPUTS} + \beta_3 HH_{FARMINPUTS} + \beta_4 HH_{ASSETS} + \beta_5 ACCESS + \beta_6 INSTITUTION + \mu \quad \text{... ... ...} \quad \textbf{Equation 4. 39}$$

The second model is a combination of market participation and intensity model. This combines a probit model for the first hurdle and later on a tobit regression model for the second hurdle. Where by the first hurdle, the dependent variable is a binary where a value 1 is given if the household sold any rice output and a value 0 otherwise. For the second hurdle, the dependent variable is continuous in nature.

$$Pr(SOLD_i = 1) = \emptyset(\beta_0 + \beta_1 HH + \beta_2 AGRI\_INPUTS + \beta_3 HH\_FARMACTIVITIES + \beta_4 HH\_ASSETS + \beta_5 ACCESS + \beta_6 INSTITUTION) + \varepsilon_i \quad \text{... ... ...} \quad \textbf{Equation4. 40}$$

$$QNTY\_SOLD_i = \beta_0 + \beta_1 HH + \beta_2 AGR_{INPUTS} + \beta_3 HH_{FARMINPUTS} + \beta_4 HH_{ASSETS} + \beta_5 ACCESS + \beta_6 INSTITUTION + MOI_i + \epsilon_i \quad \text{... ... .} \quad \textbf{Equation4. 41}$$

The table 4.1 below gives a description of the variables used and their hypothesized expected outcome.

Table 4.1: Key Model Variables; Rationale and Hypothesis

Variable	Nature of Variable	Rationale of the variable	Expected influence(hypothesis)
Dependent Variable			
MARKET_PART	Binary Variable	Represent if the farmer sold any of the harvest	
QNTY_SOLD	Continuous variable	Represents the total amount of harvest that was sold	
Independent Variables			
GENDER	Binary, 0 female and 1 male	Role of gender in market participation	+/-
AGE	Continuous variable	Role of experience in market participation	+/-
EDUCATION_D	Binary Variable	Reflect importance of human capital in commercialization	+/-
HCI index	Continuous Variable	Represents the level of participation	+
HHSIZE	Continuous variable	Household labor supply and the use of produced output	-
MARITAL_STATUS	Binary variable	The marital status of the household head	
LAND_ACCESS	Continuous variable	Total area cultivated hence output	+
HARVEST_QTY	Continuous variable	Represents the total harvest of rice realized by the household	+
AREA_HARVEST	Continuous variable	Represents the total area harvested	+
HHASSET_D	Binary variable for assets such as Radio, television set or Mobile phone	Access to market information	+
SEED_VARIETY	Binary; 1 for yes, 0 no	Use of advanced input and market participation in input market	+
INORGANIC_D	Binary; 1 for yes, 0 no	Use of advanced input	+
DISTANCE_MARKET	Continuous variable	Capture market transaction costs	-
MARKT_ORNT	Continuous variable	Captures the response of the household to market signals	+
EXTENSION_D	Binary variable	Captures access to market information	+
PREHARVETS_LOSS	Binary variable	Captures the loss before harvesting	-

Source: Author's own construction

4.7 Conclusion

This chapter clearly describes the study methodology that will be employed in order to address the set of research questions. The study uses secondary data for the fourth round for 2014/2015. Both the dependent and independent variables to be used for the three models have been coded for the main purpose of analysis. In order to analyze the data, 3 models are used where the first one is a multivariate data analysis. The second and the third model are analyzed using tobit model and the double hurdle model. Both the models analyze a two stage process where the farmer first makes a decision whether or not to participate in the market and later on the extent of market participation of the smallholder rice farmers in Tanzania.

CHAPTER FIVE

FINDINGS AND THEIR INTERPRETATIONS

5.1 Introduction

This chapter presents and discusses the empirical results on descriptive analysis and the econometric models. Descriptive statistics and their variation in explanatory variables with market participation and intensity are presented first. Later on, the diagnostic tests and a tobit and double hurdle analysis to establish the determinants of market orientation and participation are presented. Finally, the marginal effects of the explanatory variables used for the two models are discussed in detail.

5.2 Descriptive Analysis

The descriptive statistics of both the dependent and independent variables used in the regression analysis are summarized in table 5.1 below. A total of 352 households was sampled for the study. The main unit of analysis used was the household head that is said to be responsible for the decisions to be made in the household. The findings as reported by the table below shows that about 74% households are predominantly headed by male, while only 26% of the household heads were female. The results further show that the mean age for the household head is 47 years. This indicates that most rice farmers are in their mid-age hence energetic. The average family size is a total of 6 individuals with other households having a minimum of one individual while others have 30 persons in a single household.

Table 5.1:Descriptive Statistics of the Variables used in the model

Variable	Obs.	Mean	Std.Dev.	Min	Max
Market participation	352	.517	.5	0	1
Quantity Sold	352	630.39	1771.441	0	21375
HCI	352	.274	.315	0	1
Subsistence farmers	352	.56	.497	0	1
Semi-commercial	352	.341	.475	0	1
Full Commercialized	352	.099	.3	0	1
MOI	352	.132	.203	0	1
Household Characteristic					
Age	352	47.244	14.578	20	100
Gender of h/h head	352	.739	.44	0	1
Household size	352	6.352	3.846	1	33
Marital Status	352	.548	.498	0	1
Primary	352	.616	.487	0	1
Secondary	352	.094	.292	0	1
Tertiary	352	.006	.075	0	1
Farming issues					
Farm Size	352	5.96	9.84	.2	158
Area Harvest	352	1.886	3.881	.1	61
Quantity Harvest	352	1196.545	2122.965	10	23625
Inorganic use	352	.116	.321	0	1
Mechanization use	352	.145	.352	0	1
Animal Traction	352	.455	.499	0	1
Hired labor	352	.534	.5	0	1
Improved seed use	352	.043	.202	0	1
Traditional seed use	352	.892	.311	0	1
Improved seed use	352	.065	.247	0	1
Voucher use	352	.011	.106	0	1
Pre-harvest loss	352	.355	.479	0	1
Transaction costs					
Market Distance	352	10.126	11.77	0	90
Extension Service	352	.02	.14	0	1
Household Assets					
Wealth Index	352	1.059	.934	-2.568	2.536
Radio	352	.548	.498	0	1
Mobile use	352	.798	.402	0	1
Land Fragmentation	352	.429	.332	.015	3.077

Source: Author's own Computation

The results from table 5.1 above further indicate that approximately 55% of the household heads are in a monogamous marriage while the rest of 45% are either single, unmarried, polygamous married or divorced. Concerning the education level of the household head, the variable was subdivided into three categories with tertiary education level being the reference category. The findings show that 62%of the household heads attained primary education level, while 9% of them had a secondary education level. However, less than 1% of the household had tertiary education level (0.6%). The rest who are not in any of the categories are said to have no formal education (28%).

The farm characteristics of the households were well captured by the use of several variables. The mean farm size of most household was approximately 5.96 acres of land. This clearly shows that most of the households are smallholder farmers since they have access to limited land sizes, less than 10 acres(Sebatta, Mugisha, Katungi, Kashaaru, & Kyomugisha, 2014). Of the total area planted, most of the smallholder rice farmers harvested rice from about 2 acres of land. Most of the households harvested a mean of 1197 kg of rice at the end of the season. The minimum harvest being 10 kg while the maximum amount harvested is approximately 23,625 kg.

The findings from the table 5.1 above also present the agricultural practices of the smallholder farmers. Only 12% of the households used inorganic fertilizers during cultivation. The rest of them did not use any form of fertilizer in their planting season. This is concurrent with the fertilizer use statistics for SADC countries, Tanzania included. The report shows that most of the smallholder farmers don't use any inorganic fertilizer in their farms(URT, 2016b). In addition to that, only 15% of the households apply mechanization farming, 46% of them use animal traction.This

implies that the rest of the small holder farmers use hand hoes and other traditional farming methods for cultivating their rice farmers. Approximately 53% of the household hire labor for assisting them in the planting activities while the rest of the 47% use household labor.

Concerning the seed usage, the findings from the table above show the results of three seed varieties that were used in the planting season. Traditional seed variety is used as a reference category. The results show that 89% of the household used traditional seeds, 4% used improved seeds while 7% of them used improved recycled seeds. This is typically the case for most Tanzania smallholder rice farmers because the traditional seeds are readily available compared to improved and recycled seeds(URT, 2016b). The results further elaborate that only 1% of the household received these inputs (fertilizers and seed variety) through voucher and credit system while the rest received them by cash purchase. This again is consistent with the statistics provided by the agricultural reports(ESRF, 2014).

Concerning transaction costs, these are well defined by the distance to the market and market information received from extension institutions. The average distance to the market, from the farmers plot is about 10km. The table results also show that only 2% of the households receive extension services concerning market information. The rest of the 98% of the household receive market information from other informal sources other than the qualified extension agents.

The wealth status of the household was also computed by the use of PCA method. A number of assets owned were included in the computation of the wealth index. The assets included in the computation of the wealth index include land, livestock and poultry, hand hoes, radio, television, mobile phone and bicycle possession. The mean

wealth index was 1.059. In addition to that, the results from the table above show that about 54% of the households owned radio sets and 80% of the households owned mobile phones. These assets are important in receiving information of possible market channels through which the farmers could sell their output.

Concerning the HCI, it shows that only 27% of the harvested output is sold. This indicates that, most rice farmers are subsistence and they don't participate in the marketing of the surplus output. In addition to that, the HCI index was further sub-categorized into three categories; subsistence, semi commercial and fully commercial farmers. Of the smallholder farmers, more than half are fully subsistence farmers, 56%. This implies that they consume all of their total harvests. Then about 34% of them are semi-commercial. This implies that out of their total harvest, a proportion is consumed at home while the rest is sold. The rest 10% of the smallholder farmers are fully commercialized. This can be explained by the fact that they sell the full proportion of their harvest to the market. These smallholder rice farmers are entirely out to make to make profits.

The Market orientation index shows that on average, the smallholder farmers allocate only 13% of their cultivable land to growing marketable crops while the rest of the remaining land (87%) is allocated to producing domestically consumed crops. This definitely explains why the smallholder rice farmers are highly subsistence in their farming.

The table above also gives a summary of the dependent variables used in this study. The findings show that approximately 52% of the smallholder rice farming households participate in marketing their rice output while the rest 48% don't sell

any of their harvests. The mean of the quantity sold is reported to be about 630kg with a minimum of 0kg and a maximum of 21,375kg.

5.3 Diagnostic Tests

5.3.1 Multicollinearity Test

Multicollinearity is an econometric problem where there is a high linear relationship between one or more explanatory variables in a regression model. Multicollinearity affects cross section data, although the effect varies depending on the extent. The effects of high/perfect correlation between explanatory variables is that the model estimates could have unexpected sign, unreliable standard errors and artificially wide confidence intervals that would lead to accepting the null hypothesis, which would have beenotherwise rejected(Jeffrey M. Wooldridge, 2010). The tests used for this purpose were the Variance Inflation Factor(VIF).The results of the VIF test conducted are shown in table 5.2 below. The average VIF of the explanatory variables used is given as 4.946, less than the threshold of 10, which indicates that the model is free from multicollinearity problem.

Table 5.2: VIF values for Hypothesized Variables

VARIABLE	VIF	1/VIF
AGE	34.45	.029
AGESQUARE	34.25	.029
Ln AREA HARVEST	5.312	.188
Ln FARM_SIZE	5.197	.192
LAND_FRAGMENTATION	4.185	.239
LnHARVET QUANTITY	2.747	.364
MARKET ORIENTATIO INDEX	2.342	.427
ANIMALT TRACTION USE	1.691	.591
HHSIZE	1.65	.606
WEALTH_INDEX	1.588	.63
PRIMARY	1.554	.644
GENDER	1.495	.669
SECONDARY	1.451	.689
MARITAL STATUS	1.345	.744
MECHANIZTION DUMMY	1.289	.776
IMPROVED SEED USE	1.25	.8
HIRED LABOUR	1.239	.807
MOBILE_TELEPHONE	1.229	.813
VOUCHER USE	1.225	.816
RADIO USE	1.186	.843
EXTENSION ON MARKETING	1.074	.932
MARKET DISTANCE	1.069	.935
Mean_VIF	4.946	.935

Source: Authors Construction

In addition to the VIF test, another multicollinearity test was performed. This involved a Pearson pairwise correlation matrix that was generated in STATA 14(see appendix D). (Damodar, 2007) suggests that there is a problem of multicollinearity if the pairwise correlation coefficient between two explanatory variables is greater than 0.8. For the case of these explanatory variables used in this model, there is none of the pairwise comparison that has a correlation value greater than 0.8.

5.4 Determinants of Market Orientation among Smallholder Rice Farmers in Tanzania

This section seeks to test empirically the relationship between market orientation tendencies and several explanatory variables that include; age, gender, household size, marital status, level of education including primary and secondary levels, land fragmentation, market extension services, distance to the market, the wealth status of

the household, use of hired labor, inorganic fertilizers and improved seeds, access to inputs by using voucher system and use of animal traction in the cultivation of rice by the smallholders in Tanzania. The tobit regression model that was used to predict the effects of several explanatory variables on market orientation among smallholder rice farmers in Tanzania is presented in table 5.5 below. A total of 15 regressors were used, of which only 9 turned out to be significant.

Table 5. 3: Tobit Estimation Results for the Determinants of Market Orientation

Variables	Marginal effects for MOI model	
Age	-0.00304***	
	(0.00115)	
Household Size	0.000637	
	(0.00424)	
Gender	0.0304	
	(0.0394)	
Marital Status	0.0249	
	(0.0329)	
Primary Education	0.00802	
	(0.0351)	
Secondary Education	-0.121**	
	(0.0611)	
Extension Market	0.206**	
	(0.0960)	
Market Distance	0.000143	
	(0.00119)	
Inorganic Fertilizer Use	0.117**	
	(0.0514)	
Animal Traction	0.113***	
	(0.0337)	
Hired Labor	0.106***	
	(0.0310)	
Improved Seed Use	0.115	
	(0.0775)	
Voucher On Inputs	-0.308*	
	(0.165)	
Land Fragmentation	0.432***	
	(0.0462)	
Wealth Index	0.0513***	
	(0.0192)	
Constant	-0.233***	0.240***
	(0.0836)	(0.0137)
Observations	352	352

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors Construction from Survey data (NPS 2014/2015)

The results presented above indicate that the extent of market orientation is significantly determined by age, land fragmentation index, use of hired labour and use of animal traction in cultivation, all at 1% level of significance. While other control variables such as the level of education of the household head, use of inorganic fertilizer and access to market extension services determined market orientation at 5% level of significance. The farmers use of voucher system to access farm inputs was significant at 10%. The rest of their variables have no significant impact on the market orientation of the smallholder rice farmers.

The results show that there is a strong negative relationship between age of the rice farmers and market orientation where (p=1% and β=0.00304). This implies that one year increase in the age of the farmer would results to a decrease in market orientation tendencies by approximately 0.5. This tendency is consistent with other studies as reported by (Linus & Ezealaji, 2013) for Nigeria. This could be explained by the fact that older farmers are unable to contribute their own efforts (self-labor) into the production process as a means of complimenting the labor supply in-case of shortage. Another reason for the same is that most older farmers aren't risk takers since they are conservative and fear the possibility of incurring costs that wouldn't pay off just in-case they do not get markets for their produce.

The variable secondary level of education of the rice farmers was found to be significant at 5% and negatively related to market orientation tendencies of the rice farmers. The results show that one more year of secondary education reduces the market orientation tendencies of rice farmers by 12%. This could be explained by the fact that as an individual attains higher learning, they are likely to forgo farming activities for better paying white collared jobs. In addition to that, agriculture is

mainly used for subsistence farming and not a source of income. This is contrary to findings from a similar study by (Linus & Ezealaji, 2013) conducted in Nigeria. This study found that education influenced market orientation positively while another study by (Jaleta., 2010) found no significant relationship between market orientation and the education level of the farmer.

The tobit results show that hiring labor has a significant and positive impact on market orientation (at 1% level of significance). This is because the households that hired labor are 10% more market oriented compared to those that did not hire any labor. This result is consistent with what was reported by (Berhanu,Gerbremedhin; Moti, 2010). This could be explained by the fact that a farmers household that hires labor does so in order to increase its productivity and hence get surplus harvests that would enable him sell them.

Concerning the use of animal traction, the variable was found significant and positively related to market orientation (at 1% level of significance). This variable was used to indicate mechanization activities in the rice cultivation. The results show that the more market oriented farmers used animal traction and it increases the market response signals by 11%. This could be explained by the fact that use of animal traction as a form of mechanization increases the total quantity harvested which in turn results to surplus that will be available for marketing.

Agriculture extension services concerning marketing information is reported to be significantly effective in inducing market orientation propensities for Tanzania smallholder rice farmers. The results from the tobit estimation show that receiving marketing extension services increases market orientation of the smallholder rice farmers by about 21%. This could be attributed to the fact that once the farmer

receives marketing training, this could open their thinking on correct agricultural farming practices, packaging skills, negotiation skills and the ability to search for new possible markets. These results are consistent with a study conducted in Bangladesh by (Osmani & Hossain, 2016).

Contrary to what was expected, land fragmentation is positively and significantly associated to market orientation tendencies of the smallholder farmers (at 1% level of significance). The results imply that land fragmentation increase the market orientation possibilities of the smallholder rice farmers in Tanzania by 47%.This finding could be explained by the fact that fragmentation of land offers the smallholder farmer with the possibility of growing diversified crops, in which they could include marketable crops for marketing. This result is consistent to what is reported by (Gebremedhin & Jaleta, 2010).

The use of inorganic fertilizers was also found to positively influence the market orientation tendencies. The results of the tobit model show that the use of inorganic fertilizers in cultivating rice among smallholder farmers increases market orientation tendencies by 12%. This could be explained by the fact that use of inorganic fertilizers improves the value of land and hence increasing the total produce. A study by (Osmani & Hossain, 2016) that was conducted in Bangladesh also reports that the use of improved seeds increases output hence the surplus that is devoted for marketing purposes.

In addition to that, the inputs that have been received by voucher system are likely to reduce the general level of market orientation. This is because receiving inputs by voucher, which is almost free, is likely to reduce the level of market orientation by

31%. This could be explained by the fact that inputs received under voucher system don't impose a burden on the smallholder farmers.

In addition to that, the wealth of the farmer was also found to significantly and positively affect the market orientation propensities of the smallholder rice farmers. This can be shown by the results in that 1% increase in the wealth of an individual increases the market orientation propensities by 5%. This could be explained by the fact that the farmers with more assets are more likely to respond to market signals since they have wealth that can support them in the event of a loss.

Even though, some variables turned out to be insignificant. The gender of the household head, household size, marital status of the head, the household head level of education and market distance were reported to have a positive relationship with market orientation propensity, though insignificant. This implies that the household gender had no significance difference in explaining market orientation tendencies. Similarly, the differences in the marital status for smallholder farmers doesn't have any implication on the market orientation tendencies.

In order to ascertain the model fitness, a link test was performed. The test results in the table 5.4 below indicate that the model is correctly specified since the values of hat and hat squared are significant and insignificant respectively as they are supposed to be.

Table 5. 4: Model Fit Results for MOI Tobit Model

MOI	Coef.	Std.Err.	P>|t|
hat	0.959	0.0952	0
hatsq	0.115	0.167	0.491
cons	-0.00190	0.0167	0.909
se	0.238	0.0136	parameter)

Source: Authors construction from survey data (NPS2014/2015)

Furthermore, the model is correctly predicts the over 80% of the observations and it has a pseudo r square of 0.410. In addition to that, the value of the wald chi square is given as 145.83 which is significant at (pr>chi2=0.0000).

5.5 Determinants of Market Participation Decision and Intensity for Smallholder Rice Farmers in Tanzania

This section seeks to test empirically the relationship between market participation decision and intensity sales among smallholder rice farmers in Tanzania. The model was fitted with a total of 21 explanatory variables. The results were obtained for 2 separate models where the first stage, which is market participation decision was examined using a standard probit model. The second stage that was seeking to identify the factors that influenced the extent of market participation, a truncated tobit model was applied to identify the significant factors that influence the extent of market participation.

The results of the probit model of market participation decision are presented in the second column of the table 5.5 below. The Wald chi square value of 127.92 is statistically significant at 1% indicating that the explanatory variables jointly explain the likelihood of the smallholder rice farmers participating in the market. The decision to participate in the market is significantly determined by the following variables; age, age squared, size of the farm, harvested quantity, access to extension market information, the wealth of the household and land fragmentation.

Table 5. 5 :Estimates of determinants of market participation decision

Variables	Marginal effects of Market participation
Age	-0.101***
	(0.0339)
Agesquare	0.000803**
	(0.000321)
Gender	-0.345
	(0.241)
Household Size	-0.0397*
	(0.0237)
Marital Status	-0.187
	(0.203)
Primary Education	0.192
	(0.202)
Secondary Education	-0.368
	(0.305)
Extension Market Services	1.843***
	(0.467)
Market Distance	-0.000450
	(0.00567)
Wealth Index	0.316***
	(0.114)
Harvest Quantity	0.917***
	(0.102)
Pre-harvest Loss	0.205
	(0.184)
Constant	-2.787***
	(0.972)
Observations	352

(Levels of significance where)* p<0.01, ** p<0.05, * p<0.1**
Source: Authors construction using survey data (NPS 2015/2016) Robust standard errors in parentheses

The age of the household head is negatively associated with the probability of the farmer to participate in the marketing of rice. The results from the table above show that older households are less likely to sell by 10% (at 1% level of significance). This could be explained by the fact that older household are more risk averse. They care about food security for their families and hence they are less likely to sell their output. For younger household heads, they are risk takers and ready to earn income in any profitable ventures. This finding is consistent with several studies that were

conducted by (Moono, 2015b; Musah et al., 2014). Nevertheless, farmers experience is reported to positively influence the probability of the farmer participating in the rice markets. This finding is consistent with (Egbetokun, Shittu, & Ayoade, 2017). This could be explained by the fact that more experienced farmers are more likely to know about the marketing of rice.

In addition to this, the total household size of the farmer was also significant and negatively related to the probability of participating in rice markets. The results show that households with more members had a lower likelihood of selling their output by approximately 4%. This could be explained by the fact that large households have a higher consumption of the output harvested compared to smaller households. Hence this reduces the total quantity that is devoted for sale. This finding is consistent with the study conducted by (Olwande & Mathenge, 2012) in Kenya.

A high output/harvest of rice is associated with higher probability of participating in the market which is consistent with the expectation of since higher harvests ensure marketable surpluses. An increase in 1kg of rice is associated with about 92% increase in the probability of participating in the marketing rice output for smallholder rice farmers in Tanzania. This could be explained by the fact that high rice harvest results into surplus that enables the decision to sell easy as the household is assured of food availability even after it has sold out a portion of its output (Martey, Kuwornu, et al., 2012).

Concerning the asset ownership of the household, a wealth index is used. The results from the table above show that more-wealthier households are more likely to participate in the market as compared to their less-wealthier counterparts. More wealthy households are more likely to participate in the market by 32% compared to

their non-wealthy counterparts (at 1% level of significance). This finding is consistent with findings from other studies (Moono, 2015b). This could be explained by the fact that asset ownership, here portrayed by the computed wealth index, is more likely to act as a buffer for the household in the event of a loss incurred due to lower sales.

Concerning institutional services accessible to the farmer, the variable that represents market extension is significant and positively related to market participation decision (at 1% level of significance). The results from the table above show that farmers who receive marketing information from knowledgeable extension agents were more likely to participate in the rice markets compared to those who had no access to this information. This could mainly be explained by the fact that those households who received market information from extension officers knew more about the requirements of the market and how to negotiate in order to sell. These findings are consistent with several other studies like that conducted by (Wickramasinghe, Omot, Patiken, & Ryan, 2014) in New Papua Guinea and another study conducted in Uganda by (Sebatta et al., 2014).

Although some other variables were found to be insignificant in explaining the decision to participate in the market. These variables include gender, marital status, the level of education of the household head, market distance and pre harvest losses.

In order to ascertain the model fitness, a link test was performed.

Table 5.6:Model Fit Results for Market Participation Model

MKT PARTIC~N	Coef.	Std.Err.	P>|z|
hat	1.024	0.0983	0
Hat-square	-0.0944	0.0767	0.218
cons	0.0751	0.104	0.470

Source: Author's Construction from survey data(NPS2014/2015)

The test results in the table 5.7 below indicate that the model is correctly specified since the values of hat and hat squared are significant and insignificant respectively as they are supposed to be.

Table 5.7: Estimates of determinants of extent of market participation (sales)

Variables	Marginal effects Intensity equation	
Age	-0.00106	
	(0.0197)	
Age square	5.59e-06	
	(0.000206)	
Gender	0.0374	
	(0.109)	
Household size	0.00129	
	(0.0104)	
Marital Status	0.0216	
	(0.0858)	
Primary	0.0111	
	(0.0926)	
Secondary	0.118	
	(0.112)	
Extension Market services	0.196	
	(0.138)	
Market Distance	-0.00447**	
	(0.00177)	
Wealth Index	0.0794*	
	(0.0412)	
Harvest Quantity	1.000***	
	(0.0451)	
Pre-harvest Loss	0.170**	
	(0.0783)	
Market Orientation Index	1.599***	
	(0.218)	
Constant	-1.309***	0.466***
	(0.474)	(0.0286)
Observations	182	182

(Levels of significance where)* p<0.01, ** p<0.05, * p<0.1**
Source: Authors construction using survey data (NPS 2015/2016) Robust standard errors in parentheses

The second step of the model was concerned with the intensity of market participation which was measured by the quantity of rice sold. A truncated tobit

model was applied where 10 explanatory variables were used, out of which only 5 of them turned out to be significant. Market orientation index and harvested quantity were significant at 1%. The total market distance and pre harvest losses that the household experienced were significant at 5% and wealth index was significant at 10% level. The wald chi2 value is given as 1626.418 which shows that the model was significant at (prob>chi2=0.0000).

Market orientation index is significantly and positively associated with an increase in the extent of market participation among smallholder rice farmers. Market oriented farmers were more likely to sell their total rice output (more that 100%). This could be explained by the fact that they readily respond to the market signals which could include new markets in both within and outside markets. As a result of quick response, this then translates into higher sales. This finding is consistent with those from a study that was conducted to ascertain how market orientation translates to market participation in Ethiopia by(Jaleta., 2010).

Similarly, the total rice harvest is positively associated with the total quantity sold in the market. A unit increase in the rice output is associated with more that 100% increase in the total sale by the smallholder. This could be explained by the fact that higher harvests result into surpluses that translates into higher sales. This finding is consistent with those from other studies by (Moono, 2015b; Musah et al., 2014).

Ownership of assets that was indicated by the wealth index of the household is also reported to positively and significantly influence the extent of market participation. This is shown as the more wealthy farmers sell 8% of their rice output as compared to their non-wealthy counterparts. This could be explained by the fact that, the wealthy individuals are able to indulge in the risk of selling their output with a hope

that in the event of loss, their wealth will cover for difficult times. This finding is consistent with that conducted by (Olwande & Mathenge, 2012) in Kenya.

Market distance variable is reported to be negatively associated with the total sales. The results above show that 1km increase in the distance to the market reduces the total sales by 5%. This could be so because the further the market is from the farmer, the higher the transaction costs such as time and transport costs and hence the lower the participation among smallholder farmers. This finding is consistent with those from another study conducted by (J. Jagwe, 2010).

In addition to these, the variable that represented pre-harvest losses was found to be positive and significantly affect the total quantity of rice sold. The results from the model above report that farmers that experienced pre harvest losses sold 17% more of their rice harvests compared to those who didn't experience any pre harvest losses. This could be explained by the fact that farmers who experienced pre harvest losses preferred to sell their harvest in order to avoid any other losses that would occur when they decide to store for future sales.

The other five variables used turned out to be insignificant. They include age, gender, the family size, the level of education level and access to extension services on marketing issues.

Concerning access to market information, the variable showing this relationship is positively related to the extent of market participation. Access to market information through extension agents increases the total sales. This phenomena could be explained by the fact that this service enables the farmer access information concerning new market areas, the prices of the rice crop and even negotiation skills in the event of contact with possible clients. This result is consistent with a those of a

study conducted by (Okoruwa & Nkamleu, 2009) in Nigeria. Although for this case, the variable was found to be insignificant.

5.6 Conclusion

This chapter has critically addressed the intended study objectives by presenting an analysis of the determinants of market participation among smallholder rice farmers in Tanzania using National Panel Survey data 2014/2015. In particular, the author aimed to investigate the determinants of market orientation and decision and extent of market participation among smallholder rice farmers in Tanzania. In a nutshell, the results indicate that age, secondary level of education, access to market information from extension agents, use of inorganic fertilizers, land fragmentation index, the use of hired labor and the use of animal traction, access to credit for receiving inputs and wealth of the household significantly influence the level of market orientation.

Concerning decision to participate in the market, age, household size, access to market information through extension agents, wealth index and the total harvested quantity were the significant factors.

Lastly, the extent of market participation among smallholder rice farmers was determined by the market orientation index, the total quantity harvested, wealth index, distance to the market and pre harvest losses experienced by the farmer.

CHAPTER SIX

CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a conclusion made from this study that originates from the field survey findings. In addition to that, the chapter gives the main study implications of the existing knowledge, study limitations and finally the possible recommendations on areas for further studies in which other researchers can concentrate on to bridge the existing research gap.

6.2 Implications of the Research Findings

In this study the author uses NPS data 2014/2015 to document the determinants of market orientation, market participation decision and intensity among smallholder rice farmers in Tanzania. The study uses a total of 352 rice farmer households to ascertain these determinants.

Concerning the determinants of market orientation among smallholder rice farmers, the study finds out that age of the household head, the level of education, access to market information through extension agents, use of hired labor, inorganic fertilizer and animal traction, land fragmentation, access to voucher upon receiving inputs and the wealth of the farmer significantly influence market orientation tendencies among smallholder rice farmers in Tanzania.

Age of the household head is found to negatively influence the level of market orientation among smallholder rice farmers. The implication is that households with older heads are less likely to allocate their land to cultivate marketable crops. The policy implication for this is that the government, through extension agents and other agricultural agencies could advice the older household heads on the benefits of

commercialization so that they are able to take up the risk of cultivating larger farm sizes and sell their surplus harvests in-order to earn more income.

The study also finds out that market extension services increase market orientation and participation tendencies. The policy implication for this then would be that the government through agents could also provide training and seminars to smallholder rice farmers on how to search for markets and make contracts that would results into successful gains upon market participation. In addition to this, further education could be provided to the farmer in-order to sensitize them on how to effectively respond to market signals in-case of emergence of new markets like employing hired labor and using advanced mechanization that would result to higher output hence surplus.

The study finds out that the age of the household head, household size, and wealth index of the household, the total quantity harvested and access to extension services influence the decision on market participation. While the distance to the market, wealth index, total quantity harvested, market orientation index and pre harvest loss strongly influence the extent of market participation among smallholder rice farmers in Tanzania.

These results imply that smallholder rice farmers should be educated to respond to market signals like emergence of new markets. This is because the study shows that most smallholder rice farmers in Tanzania only allocate 13% of their cultivable land to produce marketable surpluses of rice. This is relatively low as it implies that most of the smallholder farmers are subsistence in their operations.

In addition to these, the results above show that the further the market is from the market, the higher the transaction costs and hence the lower the quantity sold in the

market. This then implies that if the farmers have all weather roads constructed for them, this will reduce travel time and hence increase the total sales. In addition to that, there could be farm gate markets where the farmers sell their harvests. This will reduce costs on their sides since the buyers will purchase from their point of packaging. Hence resulting into lower transaction costs.

6.3 Study limitations and Recommendations for Further research areas

The study only covered rice production and marketing for the year 2015. Although the data used is nationally representative, some very important variables are missing out in the data set. Among the missing variables is the cooperative membership status of the farmer and farming experience that the farmer has in rice cultivation. These are very important variables that would capture the ability of the rice farmer to participate in the marketing of his produce.

The study also used only one crop,rice, further studies could aim to look at how smallholder farmers perform in the marketing of other crops perform.

The study only used one wave, the current, of the National Panel Survey data 2014/2015. Hence the results from this study only occur to one year.

For further considerations, the future researches could look into the effects of market participation on welfare and food security among smallholder farmers. Even more, other studies could choose to use panel data analysis in order to analyze how the extent of market participation differs with time.

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APPENDICES

APPENDIX 1: Tobit Estimation Results for MOI Model

Moi	Coef.	St.Err	t-value	p-value	Sig.
Age	-0.003	0.001	-2.65	0.008	***
Hhsize	0.001	0.004	0.15	0.881	
Gender	0.030	0.039	0.77	0.441	
Marital Status	0.025	0.033	0.76	0.450	
Primary	0.008	0.035	0.23	0.820	
Secondary	-0.121	0.061	-1.99	0.048	**
Extension Market	0.206	0.096	2.15	0.033	**
Market Distance	0.000	0.001	0.12	0.905	
Inorganic fertilizer use	0.117	0.051	2.28	0.023	**
Animal traction	0.113	0.034	3.37	0.001	***
Hired labor use	0.106	0.031	3.41	0.001	***
Improved seed use	0.115	0.078	1.48	0.139	
Voucher on inputs	-0.308	0.165	-1.87	0.063	*
Land Fragmentation	0.432	0.046	9.36	0.000	***
Wealth Index	0.051	0.019	2.67	0.008	***
_cons	-0.233	0.084	-2.78	0.006	***
_cons	0.240	0.014	0.01	0.014	**
Mean dependent var	0.132	SD dependent var			0.203
Pseudo r-squared	0.410	Number of obs			352.000
Chi-square	145.827	Prob > chi2			0.000
Akaike crit. (AIC)	243.709	Bayesian crit. (BIC)			309.391

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX 2:Tobit Model for Market Participation

Lnquantity Sold	Coef.	St.Err	t-value	p-value	Sig.
Age	-0.121	0.068	-1.78	0.076	*
Agesquare	0.001	0.001	1.66	0.099	*
Gender	-0.443	0.538	-0.82	0.412	
Household size	-0.046	0.050	-0.92	0.356	
Marital status	-0.579	0.437	-1.33	0.186	
Primary level	0.273	0.428	0.64	0.524	
Secondary level	-0.467	0.739	-0.63	0.528	
Extension Market	1.443	0.741	1.95	0.052	*
Market Distance	0.001	0.012	0.09	0.933	
Wealth Index	1.003	0.235	4.27	0.000	***
Ln harvest _Quantity	1.926	0.205	9.41	0.000	***
Pre-harvest Loss	0.211	0.414	0.51	0.611	
Market orientation index	9.351	1.333	7.02	0.000	***
_cons	-8.773	2.029	-4.32	0.000	***
_cons	2.919	0.144	0.14	0.144	
Mean dependent var	3.233	SD dependent var			3.268
Pseudo r-squared	0.232	Number of obs			352.000
F-test	34.619	Prob > F			0.000
Akaike crit. (AIC)	1119.297	Bayesian crit. (BIC)			1177.251

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX 3: Probit Estimates Results for Market Participation Decision

Market Participation	Coef.	St.Err	t-value	p-value	Sig.
Age	-0.101	0.034	-2.99	0.003	***
Age square	0.001	0.000	2.50	0.012	**
Gender_	-0.345	0.241	-1.43	0.153	
Household size	-0.040	0.024	-1.67	0.094	*
Marital Status	-0.187	0.203	-0.92	0.357	
Primary level	0.192	0.202	0.95	0.343	
Secondary level	-0.368	0.305	-1.21	0.227	
Extension Market	1.843	0.467	3.94	0.000	***
Market Distance	0.000	0.006	-0.08	0.937	
Wealth Index	0.316	0.114	2.76	0.006	***
Ln harvest Quantity	0.917	0.102	9.01	0.000	***
Pre-harvest Loss	0.205	0.184	1.12	0.265	
_cons	-2.787	0.972	-2.87	0.004	***
Mean dependent variable	0.517	SD dependent variable			0.500
Pseudo r-squared	0.385	Number of observation			352.000
Chi-square	97.346	Prob > chi2			0.000
Akaike crit. (AIC)	325.612	Bayesian crit. (BIC)			375.840

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX 4: Truncated Regression Estimated Results for the Extent of Participation Model

Ln Qty_Sold	Coef.	St.Err	t-value	p-value	Sig.
Age	-0.001	0.020	-0.05	0.957	
Age square	0.000	0.000	0.03	0.978	
Gender	0.037	0.109	0.34	0.732	
Household size	0.001	0.010	0.12	0.901	
Marital Status	0.022	0.086	0.25	0.801	
Primary	0.011	0.093	0.12	0.904	
Secondary	0.118	0.112	1.06	0.290	
Extension Market	0.196	0.138	1.42	0.156	
Market Distance	-0.004	0.002	-2.52	0.012	**
Wealth Index	0.079	0.041	1.93	0.054	*
Ln harvest _Quantity	1.000	0.045	22.20	0.000	***
Pre-harvest Loss	0.170	0.078	2.17	0.030	**
Market-orientation index	1.599	0.218	7.32	0.000	***
_cons	-1.309	0.474	-2.76	0.006	***
_cons	0.466	0.029	16.30	0.000	***
Mean dependent var	6.254	SD dependent var			1.312
Number of obs	182.000	Chi-square			1626.418
Prob > chi2	0.000	Akaike crit. (AIC)			268.813

*** p<0.01, ** p<0.05, * p<0.1