ANALYSIS OF PRODUCTION AND MARKETING OF IRISH POTATO IN MBULU AND BABATI DISTRICTS IN TANZANIA

MATILDA ZAKAYO OMARI

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2015

ABSTRACT

Mbulu and Babati are among the districts that produce Irish potatoes in Tanzania. The crop is important in the two districts for household food security and income because it takes a short period to mature compared to other crops like maize. The present study intended to fill the information gap related to the reason behind the low production of Irish potatoes in Mbulu and Babati districts. The specific objectives of the study were: to determine factors affecting production of Irish potatoes; to determine factors affecting marketing of Irish potatoes; to describe Irish potato marketing channels and to assess Irish potato marketing margin for the key market channels. A cross sectional single-visit survey involving 80 farmers and 40 traders from Murray, Imboru, Arri, Dongobesh, Madunga and Bashnet wards was conducted. Descriptive Statistics, Multiple Linear Regression, market channels description and market margin analysis were used for addressing the specific objectives. The findings show that: bacteria wilt and Irish potato blight diseases, inadequate improved seeds, lack of extension services and problem in accessing inputs were the major challenges that caused low production of Irish potatoes in the study area. Furthermore, the findings show that poor infrastructure, perishability of the crop, lack of unified standard and poor harvesting technologies were the factors affecting marketing of Irish potatoes. Apart from that, the findings show that there were about six Irish potato marketing channels in the study area. On the side of Irish potatoes marketing margin, the findings show that food vendors in channel II that consists of producer and food vendors were the ones who got the highest marketing margin (of 63% of the total gross margin). Basing on these findings it can be concluded that low production of Irish potatoes in Mbulu and Babati districts was due to poor farming practices and management and long marketing channels which lead to low return to farmers. It is therefore, recommended that, the government and Agriculture Institution should provide education to farmers on good farming practices and management, to provide improved seed and inputs subsidies to farmers in order to improve Irish potato production in Mbulu and Babati districts.

DECLARATION

I, Matilda Zakayo Omari, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

Matilda Zakayo Omari Date
(MSc. Candidate)

The above declaration is confirmed

_____ _____

Dr. Damas Philip Date
(Supervisor)

COPYRIGHT

ACKNOWLEDGEMENTS

My thanks go to the Almighty God for great things he did to me during the research period. It is His blessing that enabled me to complete this dissertation successfully. Furthermore, this study would not have been accomplished successfully without the exerted input and support from many people and different organizations. Acknowledgement is therefore extended to the following individuals and organizations. First and foremost my sincerest gratitude goes to my supervisor Dr. Damas Philip of the Department of Agricultural Economics and Agribusiness. I thank him for his guidance, encouragement, untiring contributions, constructive ideas, criticisms and patience throughout my study. I feel privileged to have the opportunity to work under him. I would also like to express my sincere gratitude to the Muray, Arri, Madunga and Bashnet wards Executive Officers for their generous support.

Heartfelt thanks are due to my fellow students and all staff members of the Department of Agricultural Economics and Agribusiness for their support during the course of this study and my soul mate for their special social role in my studies. My sincere gratitude also is to my lovely family, special and heartfelt thanks go to my dear husband Martin K. D. Panga and my beloved children Anthony, Catherine and Emanuel for their indispensable prayers, love, support and understanding. They have always been a source of strength and encouragement to me throughout the period of my study. I would like to extend my deep and foremost appreciation to my parents, my family friends Mr. and Mrs. Damian Muhe and the former Headmaster of Mzumbe Secondary School Mr. Dismas Njawa for their assistance and advice during my study and in the whole process of research work. However, any shortcoming in this study is my entire responsibility.

DEDICATION

I dedicate this dissertation to my parents, the late Mr. Zakayo Omari and Mrs. Regina Zakayo and my husband, Mr. Martin D. Panga who provided financial support for this study. Unfortunately, my father is not with me to share the fruits of the accomplishment of this study. May Almighty God rest his soul in eternal peace, Amen.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

BLUE	Best Linear Unbiased Estimator
CIP	International Potato Centre
FAO	Food and Agriculture Organization of the United Nations
GMM_P	Producer Gross Market Margin
GMM_R	Retailer Gross Market Margin
GMM_{RA}	Rural Assembles Gross Market Margin
GMM_W	Wholesaler Gross Market Margin
IFAD	International Fund for Agriculture Development
MoA	Ministry of Agriculture
NAC	National Agriculture Census
NMM	Net Marketing Margin
OLSE	Ordinary Least Squares Estimation
SACCOS	Saving and Credit Cooperatives Societies
SSA	Sub-Saharan Africa
TASC	Tanzania Agriculture Sample Census
TGMM	Total Gross Marketing Margin
THBS	Tanzania Household Budget Survey
TZS	Tanzanian shilling
UARC	Uyole Agricultural Research Centre
URT	United Republic of Tanzania
USA	United State of America
VICOBA	Village Community Based Association
WB	World Bank
WPC	Western Potato Council

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Irish potato (*Solanum tuberosum*) also known as "earth apple" is the main root and tuber crop that is grown almost in all parts of the tropical and subtropical area and in warmer areas of the temperate regions (Akintomide and Antai, 2012). The crop is also known as round potato to distinguish it from sweet potato, and the word “Irish” came because a large proportion of Irish people depended on it for food (Demo *et al*., 2005).

Irish potato has become the fourth most important food crop in the world following rice, maize and wheat (FAO, 2004). It is grown in more than 100 countries in the world, and consumed by more than one billion people in the world (CIP, 2008). By the end of 2008 Irish potato production exceeded 320 million tons in the world, whereby China, which is the world’s biggest producer of Irish potato, produced about 570.6 thousand tons (26.4%), followed by Russia Federation 372.7 thousand tons (17.2%) and India 344 thousand tons (15.9%) of the world production (FAO, 2008). Production and consumption of Irish potato has been increasing since its introduction (CIP, 2008; FAO, 2008).

Irish potato production in developing countries has been increasing year after year. For instance in 1961, potatoes produced in the developing countries accounted for only 10.5% of the world production (Demo *et al*., 2005). A study conducted by Maganga *et al.* (2012) reported that, the production had increased to 47.2% of the world production. African countries are among the developing countries that produce more than one third of the Global Irish potato output. African countries that produce Irish potato in large amount are

South Africa, Egypt, Algeria, and Morocco (Okoboi, 2001). Apart from production, consumption of Irish potato has also increased in developing countries from 9kg per capita in 1961-63 to 14kg per capita in 1995-97 (FAO, 2007).

Irish potato production in Tanzania was introduced by the German Missionaries in the Southern Highland in 1920 (Nyunza and Mwakaje, 2012; Rahko, 2011). The crop is produced by smallholder farmers and it is used as food and source of income. Irish potatoes in Tanzania take the 8th position in the record of most important food crops (FAO, 2009). The crop has become an important food crop in the country because its production takes a short time and it is the fastest food to cook (Kelly, 2006; FAO, 2007). For example in 2008 Tanzania produced about 650 000 tons of Irish potatoes most (58%) of which came from Southern Highlands (FAO, 2009). Apart from Southern Highland, other areas in Tanzania which produce Irish potatoes in large quantities are West Kilimanjaro, Arusha, Mara and Kagera. Minor production takes place in Mara, Tanga, Kigoma, Rukwa and Ruvuma regions (Nyunza and Mwakaje, 2012).

Irish potato is important in the national for food security because it takes short time to mature and it has high yield (3.9 tons/ha) compared to other roots and tuber crops that have the yield of one ton/ha (Okoboi, 2001; Kabungo, 2008). Irish potato is more profitable for low income earners in both urban and rural areas due to the fact that, it grows fast, adaptable, high yielding and responsive to low inputs (FAO, 2004). Apart from that, Irish potato provides energy and substantial amount of high quality protein and essential vitamin, minerals and trace elements to the diet (Lamin *et al*., 2013). A single medium-sized Irish potato contains about half the daily adult requirements of vitamin C, very low in fat, more protein and twice calcium than maize (Akintomide and Antai, 2012).

Irish potato was introduced in Africa in the 19th century by colonists, who consumed it as a vegetable rather than as a staple starch (William, 1999). Irish potatoes were at first resisted by local farmers who believed they were poisonous (Demo *et al*., 2005). In the former European colonies of Africa, the crop was initially consumed only occasionally, but increased production made it become a staple in certain areas. The crop tended to become more popular during war times due to being able to be stored in the ground (FAO, 2008). In higher altitudes regions of Rwanda, Irish potatoes have become a new staple food crop. Prior to 1994 consumption was as high as 153 to 200kg per year, higher than in any Western European country (Lamin *et al*., 2013). In Kenya, the crop is the second most important staple food after maize (MOA, 2005). It is also an important food and cash crop that plays a major role in national food and nutritional security (Kiiya *et al*., 2006).

There are several varieties of Irish potatoes that are produced in different parts of the world. For example in Mozambique the common Irish potatoes which are produced are: BP1, Rosita, Roseta, Diamante, Hollanda and Ammesthyst (Demo, 2005). In Tanzania, the most common varieties which are produced particularly in Southern Highland are known as Kikondo, Arka, Kidinya, Kagiri and Tigoni. Each of the variety has different characteristics such as dry matter content, taste, yield, response to inputs, and tolerance to diseases (Goossens, 2002). These variations in characteristics show that there could be different markets for the respective varieties, and hence, different profitability. Namwata *et al*., (2012) reported that farmers who adopted improved varieties have high yield of Irish potatoes than those who did not adopt improved seed. Among of the improved varieties identified in their study were Kikondo (CIP 720050), Bulongwa, Sesamua, Baraka and Malawi. Therefore, adoption of improved varieties is very important to farmers in order to increase income (Mafuru, 2007).

Although Irish potato is not a main staple food crop for some rural areas in Tanzania, there is rapid increase in the consumption of Irish potatoes in some urban areas such as Dar es Salaam, Mwanza, Dodoma and Zanzibar (Anderson, 2008; Kabungo, 2008). Irish potato has great potential in both national and regional markets, due to growing demand for chips and snacks/crisps (Anderson, 2008). However, market functions such as assembling, grading and transport do not match with production which is increasing to meet the expanding consumer demands for Irish potatoes (Nyunza and Mwakaje, 2012).

1.2 Problem Statement and Justification

Northern Tanzania regions including Manyara are among the regions that contribute to total country production of Irish potatoes. In 2007/08 about 13 583 hectares of Irish potatoes were cultivated and about 23 611 metric tons (18.3% of total country production) were produced. Tanga was the leading region in production that account 16 593 tones, followed by Arusha 3996 tones then Kilimanjaro 1766 and Manyara had a yield of 1 256 tones of Irish potatoes (NAC, 2012).

The studies conducted by Tanya 1999; NAC (2012) show that there is scarcity of land for Irish potatoes cultivation in Manyara region. This is due to geographical location which is characterized by mountains with steep slopes and valley. Majority of farmers in Mbulu and Babati districts have a total farm land between 3–6 acres which are in the form of plots size range between a quarter of an acre to one acre (NAC, 2012). Therefore, the farmers were required to divide the available land in small plots in order to cultivate other crops and Irish potatoes.

Apart from shortage of land for Irish potato growers in Manyara Region, the yield of Irish potato per hectare in this area is low as shown in the study conducted by NAC (2012). The report in this study shows that the average yield of Irish potatoes in Manyara Region per hectare is 1.12 tones while the National average yield of Irish potatoes per hectare is 3.9 tones. Moreover, a study conducted on production of Irish potatoes in the Southern Highland specifically in Mbeya and Iringa regional shows Irish potatoes yield per hectare is 3.9 tones (Okoboi, 2001; Kabungo, 2008). In reversing the situation (that is to expand the land for cultivation) there is a need for thorough understanding on the type of technology and inputs used in production of Irish potatoes in Mbulu and Babati districts. Previous studies on Irish potatoes production were concentrated in Southern Highland specifically in Mbeya and Iringa. However, limited information was available in production of Irish potatoes in Manyara Region. Therefore, this study was carried in Mbulu and Babati districts to fill the observed information gap of Irish potatoes production in the targeted districts.

This study is therefore, intended to extend previous researches conducted in other parts of country specifically those conducted by Okoboi (2001); Kabungo (2008) in the Southern Highland with the aim of getting more insights on Irish potato production and marketing in Mbulu and Babati districts. It is hoped that the findings from this study will provide information that would enable policy makers to formulate and modify policies in order to improve Irish potato production and marketing system in the study area and other parts of Northern Tanzania in particular.

1.3 Objectives of the Study

1.3.1 Overall objective

The overall objective of this study was to assess Irish potato production and marketing in Mbulu and Babati districts in Tanzania.

1.3.2 Specific objectives

i. To determine factors affecting production of Irish potatoes in Mbulu and Babati districts;
ii. To determine factors affecting marketing of Irish potatoes in Mbulu and Babati districts;
iii. To describe Irish potato marketing channels in Mbulu and Babati districts; and
iv. To assess Irish potato marketing margins for key marketing channels.

1.4 Research Questions

i. What are the factors affecting production of Irish potatoes in Mbulu and Babati districts?
ii. What are the factors affecting marketing of Irish potatoes in Mbulu and Babati districts?
iii. How is Irish potato marketing system organized in Mbulu and Babati districts?
iv. What are the components of Irish potato marketing margins received by different actors along the channel?

1.5 Organization of the Study

This study is organized into five chapters. Chapter One provides a general background to the study, problem statement, study objectives and research questions. Chapter Two presents the review of the literatures relevant to the study while Chapter Three explains in detail description of the study area and methodology employed. Chapter Four presents results and discussion of the major findings of the study whereas Chapter Five presents the conclusion and recommendations drawn from the study findings.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Irish Potato Production and Marketing in the World

Irish potato (*Solanum tuberosum*) is a cool-season plant originally from the Andes Mountains of South America (Maganga *et al.,* 2012). The tubers are underground stems (also known as stolons). The crop was introduced in Europe from South America sometime between 1565 and 1573 (Lamin *et al.,* 2013). It was first grown in Spain by the early part of the Seventeenth century (Akintomide and Antai, 2012). Irish potato was found in the botanical gardens of many European states. English explorers brought potatoes to England. From there, potatoes were introduced into Ireland and Scotland (Lamin *et al.,* 2013). The overall Irish potato production in the world reached 320 millions tones by the end of the year 2008 (FAO, 2008). China ranks first, in Irish potato production followed by Russia, USA, Ukraine, Germany and Poland all of which constitute about 62% of total production in the world (FAO, 2008; Demo *et al.,* 2009).

The world Irish potato market has been categorized into seed potato, frozen chips, fresh potatoes, crisps and other potatoes snacks and starch (Nyunza and Mwakaje, 2012). Literature show that the world frozen chips export is leading, followed by fresh potatoes. The frozen chips market grew rapidly in the past decade and exceeded the value of fresh potatoes export for the first time in 1998 (Ferris *et al*., 2003). However, only about 2% – 3% of about 322 million tons of the world potato production is traded internationally (CIP, 2008).

2.2 Status of Irish Potato Production and Marketing in Developing Countries

It is not surprising that Irish potato has also emerged as one of the most important food crops in developing countries (FAO, 2008). The production of the crop has almost doubled

since 1991, with a corresponding increase in consumption (Hoffler and Ochieng, 2008; FAO, 2008). According to FAO (2008) developing countries produce more than one third of the world Irish potato consumed. African countries that produce Irish potatoes in large amount are Kenya, South Africa, Uganda, Egypt, Algeria, Morocco and Tanzania (CIP, 2008; Okoboi and Ferris, 2003). Kenya is the fifth biggest potato producer in Sub-Saharan Africa, with an output of 790 000 tons in 2006. In Kenya, the crop is the second most important staple food crop after maize (MOA, 2005) and plays a major role in national food and nutritional security (Muthoni and Nyamongo (2009). Apart from Kenya, Mozambique annual production was estimated to be 80 000 tonnes from about 10 000ha of land and its consumption is concentrated in major cities and in the production zones (Demo *et al.,* 2005).

A report by FAO, (2008) indicated that average yield in developing countries is low compared to North America and Western Europe. These countries often reach 40 tons per hectare, while yields in developing countries are usually below 20 tons per hectare. The low yields of Irish potatoes in developing countries have been attributed to poor agronomic practices, low use of inputs especially fertilizers, low soil fertility, limited access to good quality seeds, diseases (especially bacterial wilt, late blight and viruses) and insect pests (MOA, 2005; Nganga *et al.,* 2008; Maingi *et al*., 1992).

Irish potato global markets show that developing countries are still lagging behind on marketing process of Irish potatoes (CIP, 2008). Import and export of fresh Irish potatoes and frozen chips to and from developed countries account for 86% and 83% of the total world trade, respectively. The export share of developing countries for fresh potatoes is 14.3% and for frozen potatoes is only 2.9% (FAO, 2008). The export of Irish potatoes from

developing countries faces several constraints such as lack of cold storage, poor transportation and limited market opportunities (Ferris *et al*., 2003).

2.3 Irish Potato Production and Marketing in Tanzania

In Tanzania about 90% of Irish potato is produced by smallholder farmers in the Southern Highland where it is used as food and source of income (Nyunza and Mwakaje, 2012). Irish potato production has had a rapid growth in Tanzania since its introduction in the1920s. The crop showed positive trend of production between 1990 and 2005 where production improved from 210 000 to 260 000 tones with a rate of increase of 0.03% per year (Kelly, 2006; FAO, 2007). It is important to note that, in 2003 and 2004/05 the country recorded the lowest and highest production due to uncertain and unreliable rainfall (FAO, 2007). In addition, to unfavourable weather conditions, unstable Irish potato price discouraged farmers to grow the crop in a large amount. Therefore, availability of market opportunities will encourage the smallholder farmers to improve production so as to meet the increasing consumers demands (Mpogole *et al.,* 2012).

Irish potato market in Tanzania specifically in urban areas has been expanding positively since 1920s'. The consumption of the crop is increasing due to the growing demand for chips and snacks/crisps (Koizumi, 2007; Anderson, 2008; Namwata *et al*., 2010). The increase in demand can be traced to many factors, including increasing economic activities, urbanization, tourism, and changing lifestyles, each and every one of which are shifting consumer food preferences towards simple to cook and processed foods (Anderson, 2008; CIP, 2008; FAO, 2008). Although there are opportunities for regional and international trade the country export a very small amount of potato due to low production (Namwata *et al*., 2010). Irish potato farming practised in Tanzania is somehow for the home market because all product produced was consumed within the country.

2.4 Factors Affecting Production of Irish Potatoes in Tanzania

Irish potatoes are grown in area between 1800 and 2700 meters above sea level (Akintomide and Antai, 2012). In Tanzania the crop is mostly produced in the Southern Highland Zone mostly in Iringa and Mbeya regions (Kabungo, 2008). Although the increasing production and demand of the crop has been increasing there are several challenges that farmers face, among of them are: Lack of certified seeds, limited access to credit and extension services, unaffordability of inputs like fertilizers, incidence of pests and diseases, inadequate good storage facilities and farming equipment (Namwata *et al*., 2010).

2.4.1 Lack of certified seeds

In Tanzania there are no specialized seed potato farms or companies. Therefore, there is no supply of certified seeds to the extent that farmers almost solely depend on informal seed sources (farm-saved, local markets or neighbours). Self-supply is the major source of seed for most farmers (Rahko, 2011). The concept of certified Irish potato seed is not clear to most farmers in developing countries (Muthoni and Nyamongo, 2009). Most people believe that when productivity of a variety decreases then the variety is "used to" or "too familiar" to the soil. They then usually buy seeds from another area or exchange their seed with their neighbours or try and change the location of their potato plot (Nganga *et al*., 2003). Farmers frequently plant the smallest tubers (chats) as seeds and either eat or sell the bigger (Muthoni and Nyamongo (2009). These small seed tubers produce single stems, produce few tubers and are susceptible to diseases such as bacterial wilt and other environmental stresses (Kaguongo *et al.,* 2008).

2.4.2 High cost of inputs

High cost of inputs especially fungicides and fertilizers greatly limit the production of Irish potato in Tanzania (Kabungo, 2008). This leads to under application of fungicides and

fertilizers, hence leading to low yields. Irish potato responds very well to fertilizers. Phosphate promotes high starch content in the tubers, while potassium application improves the storage quality. Potatoes are susceptible to chloride, which reduces their starch content. Hence it is suggested that chloride containing fertilizers should be avoided in Irish potato production (Hakiza *et al.,* 2000). High cost of inputs for Irish potatoes production lead farmers to produce more maize than Irish potatoes because maize does not require heavy inputs as compared to Irish potato (Demo, 2005). Also, maize can be stored for a longer time compared to Irish potato, which is highly perishable.

2.4.3 Land availability and tenure

Farm sizes for most of Tanzanian smallholder farmers range from 2.0 to 7.5 acres (Wolter, 2008). This is expected, given that it has often been reported that smallholder farmers in Tanzania farm on small and fragmented plots (Sokoni, 2008; Wolter, 2008). According to Maganga *et al*. (2012), the problem of land shortage to most of Irish potato growers in the country is due to the rapid expansion of potato commercialization that leads to richer farmers to purchase land from smallholders farmers. Other problems related to shortage of land specifically in Mbeya are that the areas are characterised by mountains with steep slopes and valleys, and remoteness of some areas, as it is very far from potential market centres and has poor transport infrastructure (Mpogole *et al.,* 2012). Therefore, this situation makes producers to cultivate Irish potato on small and fragmented plots (Mpogole *et al.,* 2012). This situation also lead farmers to plant crops on the same land, practising intensive cropping systems that lead to decline in soil fertility occasioned by continuous cultivation without adequate replenishment of nutrients (Kaguongo *et al.*, 2008, Kiiya *et al*., 2006).

2.4.4 Capital (Initial capital)

Capital plays crucial role in any production process, therefore lack of capital for purchasing inputs and technology are among the major factors affecting agricultural productivity (Ali *et*

al., 2001; Senkondo, 1988). Small scale farmers need cash to enable them to pay for improved inputs timely which are primarily the determinant of the crop yield (Ali *et al*., 2001). Capital also enables the farmer to pay casual labour especially during the weeding and harvesting season where the wage rate is high increasing due to increasing demand (Kabungo, 2008). Lack of capital is often highlighted as serious constrain to invest in new technology (Schechambo *et al*., 1999).

According to Maganga (2012) capital especially initial capital is very important for Irish potato growers for buying inputs like quality seeds which have high yielding ability and disease tolerance, fertilizer and agrochemicals. Capital is also important in increasing size of the land for Irish potato production either by buying or renting land, for consultation of extension services and all other cost related to Irish potato production. Low capital results to low net return per hectare of Irish potato due to poor management practices of the farm like application of poor technology, small area cultivated, low soil fertility because of non-application of fertilizer, prevalence of pests and diseases, poorly organized seed supply and tuber storage problems (Mugisha *et al.,* 2010). Therefore, capital is very important for Irish growers in increasing production.

2.4.5 Diseases that attack Irish potato

Bacterial wilt which is caused by *Ralstonia solanacearum* and Irish potato blight which is caused by *Alternaria solani* are regarded as an important disease contributing to yield reduction (Mureithi, 2000; Otipa *et al*., 2003; Kaguongo *et al*., 2008). Bacteria wilt disease is considered to be more problematic than late blight since it has no known chemical control procedures and many farmers do not know how to control it (Kaguongo *et al*., 2008). Though it can be controlled through crop rotation, but this is not feasible due to small farm

sizes which hinder effective rotation programmes (Muthoni and Nyamongo, 2009). The disease has been reported to cause losses ranging between 30-70% at altitudes ranging from 1800 to 2800 m (Otipa *et al*., 2003).

Increased bacteria wilt occurrences can be explained by lack of appropriate management practices, as research on this subject has been at very low stage (Lemaga, 1997). Seed tubers with symptomatic or latent infection are effective source of inoculums of *Ralstonia solanacearum* leading to disease outbreaks and pathogen spread from place to place and from season to season (Muthoni and Nyamongo, 2009). Seed is an important factor in wilt management and in order to develop meaningful control practices, it is important that the status of bacterial wilt in seed tubers is available to farmers from various known sources (Nyangeri *et al*., 1984; Kinyua *et al*., 1998).

2.4.6 Access to extension services

The possibility of access to extension services in most of rural areas in Tanzania is low (Rahhi 2011; Kabungo 2008). Lack of accessibility to extension services has been reported in many parts of SSA including Tanzania as the limiting factor for increasing agricultural productivity (Junge *et al*., 2009; Okoedo-Okojie and Onemolease, 2009; Eze *et al*., 2006). In addition, low productivity of Tanzanian agriculture is claimed to be derived from poor knowledge on farming and proper use of inputs like fertilizer and agrochemical due to lack of extension services (Mpogole *et al.,* 2012). Extension officers have very important role in Irish potato production because farmers depend on them on better application of inputs and good farming practices in order to improve Irish potato production. Therefore, it is expected that the availability of extension services will help farmers to have knowledge on cropping patterns and crop management practice (Namwata *et al.,* 2010).

2.4.7 Labour requirements

Labour is of the most important factor involved in Irish potato production. Most of the farm operations in Irish potato production are labour intensive (Lamin *et al.,* 2013). According to Monlruzzaman *et al*. (2009) human labour is among the most 20 important input for crops production. It is required for land clearance and preparation, fertilizer application, intercultural operations, irrigating, insecticide application and weeding. Weeding is a critical activity and a major determinant of final yields. In Irish potato production the work is done at least twice per production time and normally performed by the member of the family (Akintomide and Antai, 2012).

It is important to note that, weeding of Irish potato does not require more labour compared to harvesting of the crop. Harvesting is the most labour intensive thus households with labour shortage tend to hire labour to increase manpower for harvesting (Kabungo, 2008). Nyunza and Mwakaje, (2012) argue that in Irish potato production human labour is more important during harvesting because the activities are performed by hand using hoes or stick. This work is very laborious and time consuming because Irish potato is unfit to eat when it is bruised or injured by cuts or fork holes during digging and handling. Hence the work needs the workers to pay more attention and to be more careful (Maganga *et al.,* 2012).

2.4 8 Access to credit

Lyatuu (1994) reported that it is difficult for small farmers to get credit from big financial institutions like banks, because it is difficult for the financial institutions to deal with smallholder's farmers mainly due to lack of adequate collateral, the high incidence of default and administrative costs associated with small loans. Lack of credit to rural farmers

is among the major impediments to most farmers in rural Tanzania (Nyunza and Mwakaje, 2012). This results to production of low quantity of Irish potato because of farmers' cash flow problems that affect acquisition and use of optimal farm inputs. A study conducted by Namwata *et al.* (2010) shows that many Irish potato farmers were unable to control bacterial wilt and other related diseases such as potato tuber and late blight due to low income. Consequently, these diseases reduced Irish potato productivity.

2.5 Factors Affecting Marketing of Irish Potatoes in Tanzania

2.5.1 Poor marketing channels

During harvesting period most farmers do not store potatoes but sell directly from the field. This leads to having surplus in the market which depresses prices hence low net returns to farmers (Kabungo, 2008). It was suggested that on-farm storage of potatoes can help in price levelling assuming that lack of appropriate storage rather than immediate cash needs is the main reason for selling potatoes straight from the field (Kirumba *et al*., 2004).

Moreover, multiple handling of up to 5 different handlers of Irish potatoes from the farm to the final consumers is another factor that affects prices and quality of Irish potatoes (Muthoni and Nyamongo, 2009). The domination of brokers along the marketing channel is among the factors that contribute to increase Irish potatoes market channel and decrease in margin. Muthoni and Nyamongo (2009) claimed that, over 90% of Tanzanian farmers sell their potatoes through middlemen and brokers. Thus, most of the farmers are exploited because there is a wide fluctuation of farm gate and market potato prices (Kaguongo *et al*., 2008). For example, in Kenya consumer prices are higher than market expectation since the price rise up to 300% and the margins between the wholesale and retail prices in the urban areas are also high (up to 40%) and are mainly caused by inefficient distribution systems (Kirumba *et al*., 2004).

2.5.2 Poor infrastructure

Most Irish potato growing areas are characterized by poor infrastructure due to the geographical location (Akintomide and Antai, 2012). Poor infrastructure increases market cost such as, the cost of shipping from area of surplus production to distant markets, where prices are higher. Market infrastructure can be classified as hard (such as road) and soft (such as access to credit, extension services, marketing information, security, risk bearing and agricultural inputs (Temu and Temu, 2005). Different studies indicate that transporting Irish potatoes to markets accounts for approximately 23% of the wholesale price (Mpogole *et al*., 2012; Namwata *et al*., 2010; Kabungo, 2008).

Therefore, lack of well-functioning market increases risks and cost for market participants (Mwanukuzi, 2010). That is the flow of market information within markets themselves and to farmers is also erratic and unreliable due to market level having underground cartel-like operators both at the market place and at farm level (Agwu *et al.,* 2008; Odoemenem and Obinne, 2010). Thus, there may be a need for positive action by public agents to provide some of the basic services and create an environment conducive to efficient marketing of Irish potato. Hence a well-functioning infrastructure is critically important to efficient agricultural marketing (Kabungo, 2008). This is because the presence of good infrastructure is expected to increase efficiency of both marketing and production as it reduces transaction cost and insure more competitive pricing condition in marketing than would happen in their absence (Maganga *et al.,* 2012).

2.5 3 Unstandardised unit measure for selling Irish potato

Irish potatoes are usually sold in bags and not weights (Muthoni and Nyamongo, 2009). Farmers usually pack Irish potatoes in extended bags (locally known as *Lumbesa*) instead of

using a standard bag of 100-110 kg per bag, farmers normally overfill bags that contain between 120 and 200 kg of potatoes depending on their target market (Kaguongo *et al.,* 2008). However, lack of unified standards for Irish potato is one of the main problems in the farming and trading of the crop in Tanzania (Rahko, 2011). This contributes to reducing the farmers' gross margin and is sometimes unable to know the actual amount they pack in the bag. This problem is common in developing countries where standardization is none existent. For instance, in Kenya the official standardization of Irish potato package into 110 kg bag was done only towards the end of 2008 and even then its enforcement is doubtful (Muthoni and Nyamongo, 2009).

2.5.4 Low price and perishability of Irish potato

Marketing of Irish potato is constrained by high product perishability and limited on-farm storage facilities (Maganga *et al.,* 2012). Improving Irish potato marketing is very important in order to improve the livelihood of the farmers, although it is a neglected aspect within Irish potato industry. Mussei *et al*. (2000) claimed that, the main problems facing Irish potato farmers in Tanzania are low prices, unstable prices and unreliable markets due to lack of cold storage, poor transportation and limited market opportunities. This situation leads farmers to sell their produce even if the price is not competitive (Ferris *et al*., 2003). Another factor that contributes in lowering the price of Irish potato in Tanzania is limited opportunities for penetrating the frozen chips and fresh potato through existing regional and international trade market (Namwata, 2010). Although, there is a cross border trade ongoing on in fresh Irish potatoes between Tanzania and other countries such as Zambia, Malawi and Kenya, the amount traded is still very low (Sokoni, 2001).

In addition, Tanzania cannot export Irish potatoes to other neighbouring countries specifically Kenya, because they have sufficient production, which is backed up by

improved seed and ware potato production development programmes (Nyuza and Mwakaje, 2012; Rahko, 2011). For example, farm gate price of Irish potato in Kenya range from Ksh 1000-2000 approximately 10 000-20 000 TZS per bag (140kg) (Kirumba *et al.,* 2004). Whereby in Tanzania farm gate price range from TZS 17 000 and TZS 22 000 per bag (Nyuza and Mwakaje, 2012). This is due to the high demand and low supply of the product within a country.

2.6 Marketing Channel Theory

According to Giles, (1973) the term 'channels of distribution' refers to the system of marketing institutions through which goods or services are transferred from the original producers to the ultimate users or consumers. Most frequently a physical product transfer is involved, but sometimes an intermediate marketing institution may take the title of goods without actually handling them. These intermediaries constitute a marketing channel also called a trader channel or distribution channel (Takele, 2010).

DucHai (2003) defined marketing channels as "alternative routes of product flows from producers to consumers. The marketing channel starts at the farm-gate and ends at the consumer's front door. The marketing channel approach focuses on firm's selling strategies to satisfy consumer preferences (Takele, 2010). Producers, wholesalers and retailers as well as other channel actors existing in the channel carry out marketing function that contributes to the product flow. This widens the marketing choices for a farmer and hence leads to the growth of potential marketing channels which in turn contribute to better prices and high gross margins. Sokoni (2001), Ferris *et al.* (2003) reported that marketing channel in Uganda consists of farmers/producers village traders, urban brokers, wholesalers, processors and consumers. Nyange, (1993) reported that Irish potato marketing channel consisting of producers, truckers, wholesalers, retailers, hawkers and consumers.

2.7 Review of Analytical Techniques Used in the Study

2.7.1 Multiple linear regression model

According to WoldBank, (2009); Cohen *et al.* (2003) regression analysis involves techniques for modelling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps to understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held constant. Regression analysis is widely used for prediction and forecasting, as well as to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships (Manage, 2007).

Regression analysis can also be used to infer causal relationships between the independent and dependent variables. According to Gujarati, (1995) in estimating linear regression models, the Ordinary Least Squares Estimation (OLSE) is commonly used. This technique is appropriate for single equation models. The Ordinary Least Squares (OLS) was employed to examine the impact of different factors influences production of Irish potatoes in Mbulu and Babati districts. The OLS estimation approach needs to select the population parameter such that the ordinary sum of square of errors is minimized. Thus OLS estimation leads to Best Linear Unbiased Estimator (BLUE) (Gujarati, 1995).

The advantages of using OLS estimation techniques is that it is simple to use, well-expressed and gives the best estimator, and it does not require the knowledge of the probability distribution of the underlying population being studied (Gujarat, 1995). Some of the limitations of OLS is bias. Moreover, OLS methods may give inconsistence estimate of

the parameter β since the residual is correlated with independent variable (Cohen *et al.,* 2003).

2.7.2 Marketing margins and price

Marketing margin analysis helps to identify the impact of intermediary market participants on the price paid by the consumers and that received by the producers (Smith, 1999; Quaye and Kanda, 2004). It can be defined as the difference between the prices received by producers and those paid by consumers (Tomek and Robinson, 1990). According to Cramers and Jensen (1982), marketing margin is the percentage of the final weighted averages selling price taken by each stage of the marketing chain. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his product. In other words it is the difference between retail price and farm price (Mendoza, 1995). Computing the Total Gross Marketing margin (TGMM) is always related to the final price paid by the end buyer and is expressed as percentage (Mendoza, 1995). However, in Tanzania there is lack of studies on margin and price particularly in Irish potato. A study conducted by Nyange (1993) revealed that largest margins were found among hawkers. Ferris *et al*. (2003) also recognize that transporters get more than 35% of net margin, wholesalers earn a net margin of 9.5% and retailers get 12.3% per100kg bag of Irish potatoes. Nevertheless, it is cautioned that increasing in consumer shilling is not an indicator that farmers are better off, nor a decline in consumer share prices is an indicator that farmers are worse off and marketing firms are performing poorly (Nyange, 1993). Therefore, this study had also found marketing margin and price of Irish potatoes in Mbulu and Babati districts.

CHAPTER THREE

3.0 METHODOLOGY

This study has made use of various methods in order to get the information concerning Irish potatoes production and marketing in Mbulu and Babati districts. In this section the study describes the conceptual framework, study area, research design, sampling procedure and technique, targeted population and size and the method used in data collection and analysis. The present study was conducted in Mbulu and Babati districts in Manyara Region. Four wards that are Bashnet, Madunga, Arri and Murray which had high production of Irish potatoes were selected purposely.

3.1 The Conceptual Framework

The present study assumes that, quantity of Irish potatoes produced and marketed is the major aspects that determine or affect smallholder farmers' income. Fig. 1 illustrates that enhanced high valuable Irish potato production depends on socio-economic characteristics (variables) such as: labour, land, capital, technology, age, sex, household size, and education level which are in line with institutional stimulation and organizational structures leading to farmer's decisions on the better farming activities. Therefore, social economic factors have been considered to arouse acceptance of the greatest production and marketing in a meaningful way to the limited resource of land by Irish potatoes farmers.

In addition, the greatest production and marketing of Irish potato also depend on the strength of farmers' organization and their leadership. This strength would help on finding the best way of searching and utilizing improved technology as a requirement for efficient utilization of available resources of land, labour and capital. The use of improved

technology leads to increase in yield of Irish potato hence high income to farmers and low poverty levels among the producers of Irish potato in the study area.

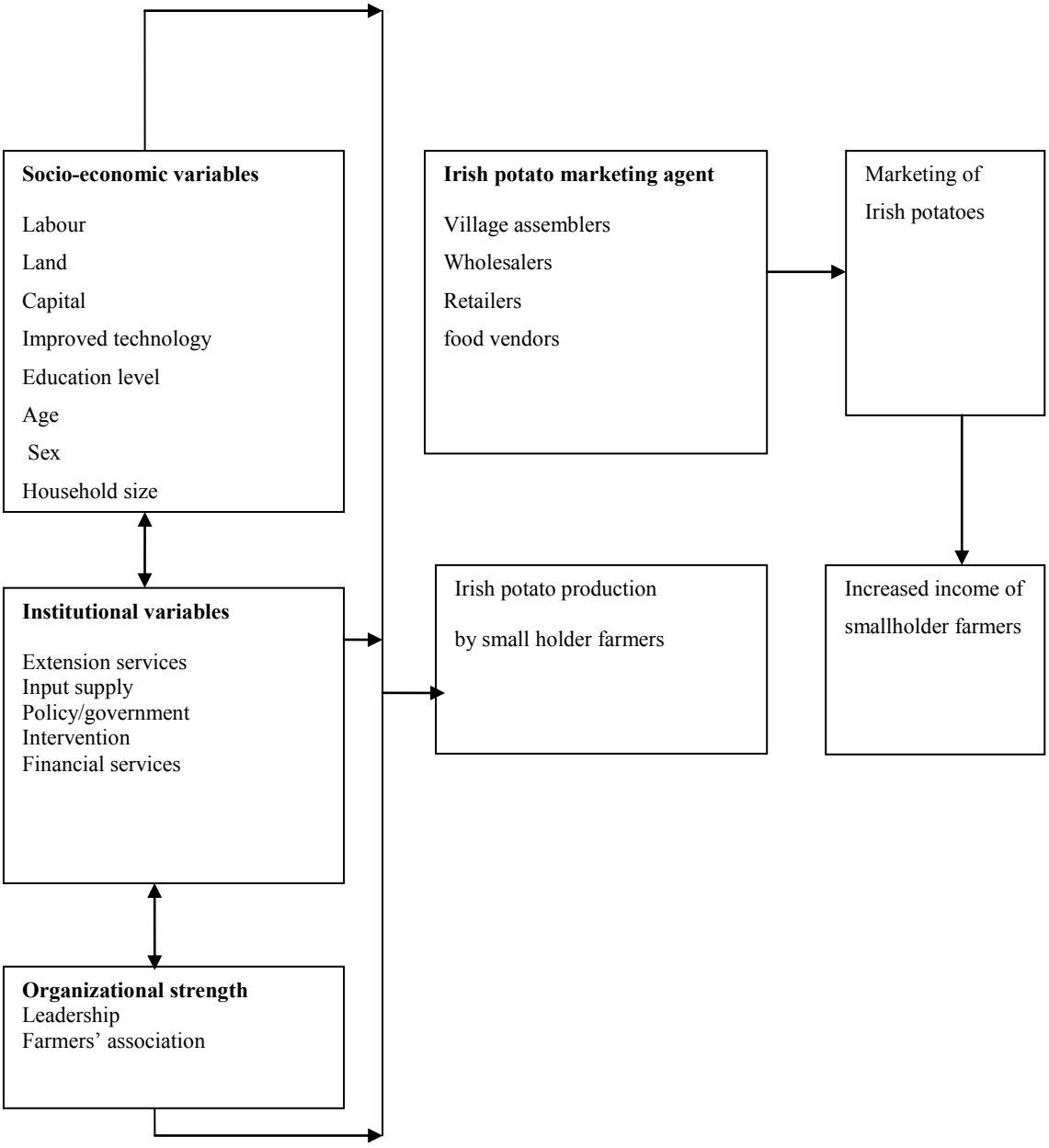

Figure 1: Conceptual framework of the study

Source: Modified from Nyunza and Mwakaje (2012)

3.2 Selection and Justification of the Study Area

This study was conducted in Mbulu and Babati districts, in Manyara Region. The choice of the study area is based on the fact that Mbulu and Babati districts are among the areas where Irish potatoes are produced in Tanzania. Nevertheless, little information is available about Irish potato production and marketing in the area. This could be due to low level of production of Irish potato in the area compared to other parts of the country like Iringa and Mbeya. Another factor could be due to remoteness of the area that leads to the area not to be known to most academicians.

3.3 Description of the Study Area

3.3.1 Location of Mbulu District

Murray and Arri are popular wards for Irish potato production in Mbulu District in Manyara Region. Mbulu District is bordered by Karatu District and Lake Eyasi in the Northern part, and Babati, Hanang and Iramba districts in the East, South and West respectively (Mbulu District Profile, 2012). Mbulu District is between Latitudes 3^{o}- 4^{o}S and Longitude 34◦-35'E in the Rift Valley of the Northern Tanzania. The District lies between 1000 m to 2400 m above the sea level.

3.3.2 Population of Mbulu District and its distribution

According to URT (2012), the district had a population of 320 279 people, among them males were 161 548 and female 158 731. The average household size was 6.0 which was higher than the national average of 4.8. Murray and Arri population was 9 965 and 12 798 people respectively (URT, 2012). The Iraqw people occupy permanent dispersed settlements throughout the districts, and live in homesteads occupied most commonly by a man and one wife and children. Polygamy is culturally acceptable and practiced, but not widespread (Mbulu Districts Profile, 2012).

3.3.3 Climate of Mbulu District

The climate of Mbulu District varies from one area to another within the District**,** the short rains fall in the District between November and February. The long rainy season is between March and May and the long and cold dry seasons extend from June to October (Mbulu Districts Profile, 2012). Almost half of the District receives an average rainfall of 600 mm which is generally considered as a limiting factor for reliable agricultural production (Tanya, 1999). The annual temperature ranges from 15 ^{0}C to 24 ^{0}C.

3.3.4 Main economic activities in Mbulu District

The report by Mbulu District Profile, (2012) shows that, about 90% of the whole District labour power is employed in crop and livestock production as the main economic activities. The dominant tribe in the area is Iragw and it covers most of highland areas in the District and they often practice mixed farming. Irish potato production is practised in this highland particularly in Tumati, Arri, Tlawi, Murray and Kainam wards.

3.3.5 Location of Babati District

Babati District occupies a transitional area between the lowland Rift Valley Plains and the highland Mbulu plateau. Most of the areas are found between 700 - 1000 meters, and comprises rolling crop lands, interspersed with occasional and diminishing wooded bush lands (Babati District Profile, 2012). The district lies between 4’ 13’S and 4’12 Latitudes and 35’ 45’E and 35’44 Longitudes. The topography of the District is characterized by rising and falling hills and mountains which are part of the Rift Valley highlands.

3.3.6 Population of Babati District and its distribution

Babati District has a population of 312 392 people with the average of 158 804 men and 153 588 women. The average household size is 5.2 which is higher than the national

average of 4.8 people. The predominant habitants in the District are also Iragw tribe (Babati District Profile, 2012).

3.3.7 Climate of Babati District

The climate of Babati District is dry and semi-humid in some parts in areas on the higher altitudes (Tanya, 1999). Rainfall is between 500 – 1200 mm yearly whereby the short rains are between October to December and long rains start in February and end in May.

3.3.8 Main economic activities in Babati District

Land pressure is more acute in this District. Farmers of this area travel long distances from their homes to search for suitable area for cultivation. Crop production is the most important source of food for all households. Iraqw farmers plant a wide variety of crops, including maize, Irish potatoes, sorghum, wheat, finger millet, beans, pigeon peas and pumpkins. Maize and beans are the most important food crops while pigeon peas, Irish potatoes, and beans are the most important cash crops. Babati District farmers use either tractors or oxen (or both) to plough and prepare land for planting. Access to oxen or cash to hire tractors is a challenge for most of the households. Bashnet and Madunga are famous wards for Irish potatoes production in this district (Babati District Profile, 2012).

3.4 Research Design

The present study employed a cross-sectional single visit survey to collect qualitative and quantitative data. This design allowed collection of data at one point-in-time (Bailey, 1994). Data collection was done on December 2012 after harvesting of dry season crops and during weeding of the rainy season crop. According to the nature of the study the design was feasible, economical and enabled the researcher to collect the data which were required to determine relationship variables of interest.

3.5 Sampling Procedure and Techniques

The present study adopted both judgmental/purposeful and simple random sampling techniques. Purposeful sampling technique was used to select division and wards by considering the wards that are involved in Irish potatoes production in the districts. Simple random sampling technique was used to select villages and sample respondents.

3.6 Target Population and Sample Size

The target population for the present study included producers (farmers) and traders (wholesalers, retailers and food vendors**)** of Irish potatoes. According to Godden (2004) in order to determine the sample size for infinite population (where the population is greater than 50 000) the formula presented in equation 1was used.

$$n = \frac{(Z\alpha_{/2})^2 P(1-P)}{\lambda^2} \quad \text{..... (1)}$$

Whereby

n = sample size

$Z\alpha_{/2}$ = Z-Value

P= percentage of Irish potatoes producers (smallholder farmers), traders (wholesalers, retailers and food vendors) of Irish potatoes.

λ= maximum error; since total population was not known for the study population, its value was assumed to be 8.5%. By assuming confidence interval of 95% for the estimated population maximum error of 5%.

Z-values (cumulative normal probability table) represent the probability that a sample will fall within a certain distribution.

The Z values for confidence levels are:

1.645 = 90 percent confidence level

1.96 = 95 percent confidence level

2.576 =99 percent confidence level

In this study 95 percent confidence level was chosen and for that matter the formula works as follows:

$$n = \frac{(Z\alpha_{/2})^2 P(1-P)}{\lambda^2} \quad \text{.....(2)}$$

Where
$Z\alpha_{/2} = 1.96$

P = 8.5% = 0.085
$\lambda = 5\% = 0.05$

$$n = \frac{(1.96)^2 \times 0.085 \times (1 - 0.085)}{(0.05)^2}$$

$n = 119.5 \approx 120$

A sample size of 120 respondents was obtained from the above calculation whereby 60 respondents were selected in each district. Since producers were many in the study area compared to traders, the number of producers included in the sample was greater than the number of traders. Random sampling technique was used to select 40 producers from each district to represent Irish potatoes producers in the study area. On the side of traders sampling frame for wholesalers, rural assemblers, retailers and food vendors was established, thereafter simple random sampling technique was used to select 20 traders from each district. Producers were found in Long, Qameyu, Arri and Kuta villages, while traders were found in the division centres that were Bashnet and Endakikoti. The detail of the samples used is presented in Table 1.

Table 1: Sample Composition

Districts	**Babati**			**Mbulu**		**Total**
No. of respondents	60			60		120
Division	Bashnet		Dongobesh	Endakikoti	Nambis	
No. producers	40		20	-	20	80
No.Traders	20		-	20	-	40
Wards	Bashnet	Madunga	Arri	Imboru	Murray	
No.of producers	20	20	20	-	20	80
No. of traders	15	05		20	-	40

3.7 Data Collection Process

The data were collected using both primary and secondary data collection methods. The primary data were collected from individual respondents from the sample while the secondary data were collected from the districts agricultural officers, Journals and research studies.

3.7.1 Primary data

Primary data were collected from a sample of respondents selected that include farmers, traders, cooking vendors and consumers. The data were collected through a questionnaire survey. The data collected included; general characteristics of households, factors affecting production and marketing of Irish potatoes, cost of production and the use of various farm inputs and the factors affecting marking of Irish potatoes. Other information collected were those related to marketing channels and market margins.

3.7.2 Secondary data

These are data obtained from literature sources or data collected by other people for some other purposes. They include both unpublished data and published ones (Saunders *et al.,*

2000). Secondary data were collected from different sources such as, Districts Agricultural Offices, business and marketing publications, research studies from SUA Library and the internet. Data collected included; Districts social economic profile, the size of the land used in the districts for the Irish potato production, mode of contract between farmers and traders within and outside the districts and opportunity and obstacles in production and marketing of Irish potato.

3.8 Data Analysis and Presentation

The collected data were coded and then analysed by using quantitative and qualitative analytical methods. Qualitative analysis involved descriptive statistics such as means, frequencies and percentage. Marketing margins were also computed. Statistical Package for Social Sciences (SPSS) program and Microsoft Excel were employed in data analysis.

3.8.1 Analysis of factors affecting production and marketing of Irish potatoes

In analysing factors affecting production and marketing of Irish potatoes in Mbulu and Babati districts both descriptive and multiple linear regression model were used to analyse the data. Multiple linear regression model was used to analyze factors affecting production of Irish potatoes in Mbulu and Babati districts while descriptive statistics were used to analyse factors affecting marketing of Irish potatoes in the study area. In the regression analysis, yield of Irish potato was considered as dependent variable, and factors affecting yield of Irish potatoes were used as independent variables. These factors include variables such as sex (X_1), age (X_2), education(X_3), household size (X_4), experience in Irish potato production (X_5), and farm size (X_6). Other variables include type of seeds (X_7), accessibility to extension services (X_8) and access to inputs (X_9) (Equation 2).

Mathematical specification of multiple linear regressions model

$Y= \alpha+\beta_1X_1\ \beta_2X_{2+}\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\beta_8X_8+\mu$……..……...……..….(3)

Whereby:-

Y	=	Quantity of Irish potato produced in kg/ha
α	=	The intercept of the regression equation
β_1- β_9	=	The parameter to be estimated
X_1	=	Sex of household head expressed as dummy, 1= male, 0=otherwise
X_2	=	Age of household head (years)
X_3	=	Education level of the household head measured in years spent in schooling
X_4	=	Household size (Number of individuals in a household)
X_5	=	Number of years engaged in Irish potatoes farming
X_6	=	Farm size was expressed as the total amount of land in hectare under Irish potato cultivation for 2012/2013 growing season
X_7	=	Type of seed used in production expressed as dummy, 1= Improved seed, 0=otherwise
X_8	=	Access to extension services expressed as dummy, 1= access, 0=otherwise
X_9	=	Access to input expressed as dummy,1=Have access, 0=otherwise

Definition of the variables used in regression model and expected effect (- or +)

Dependent variable (Y)

Quantity of Irish potato produced per hectare was obtained by converting number of bags obtained in kilograms by multiplying by 140 as one bag is equal to 140kg.

Independent variables

Age: This was considered because it was thought to influence attitudes towards information sources. Age is associated to decision making process. Increase in age is related to farming knowledge and experience, thus it is expected to influence yield of Irish potato. It is expected through experience a farmer can be good in the selection of high yield seeds and have a different technique on how to overcome the problem related to diseases.

Sex: This factor was considered because in most African cultures, men dominate economic activities and women are denied from ownership and control of resources. This variable was considered due to the fact that land is inherited only by sons and never by daughters. The implication of this has effect to decision making on crop production, which is highly influenced by men. This situation can be attributed to the fact that Irish potato production is capital and energy intensive activity that is why few women are involved in Irish potato production. Therefore, it is expected that when a large number of men participate in Irish potato production there would be high yield of Irish potatoes.

Education level: The level of education of a respondent may have positive or negative effect on the adoption of new changes in agricultural innovation/ technology. It is expected that those who have high level of education to have high Irish potato yield.

Household size: Household size is also an important aspect to be considered in Irish potato production. The household which has a large family size is expected to have cheap labour for farm activities. This implies that the available capital can be used in buying the important inputs for production hence increase the Irish potatoes yield.

Experience: Number of years engaged in Irish potatoes farming activities is expected to have a positive impact in Irish potato yield. This is related to wide knowledge on farming

activities and adoption of the new technology due to an experience in crop cultivation therefore increase in yield.

Farm size: This is measured in hectare and it is postulated to pressurize the increase in Irish potato yield. Given the prospect and from economic point of view, smallholder farmers are expected to commercialize Irish potatoes by allotting more area to it and sell a bigger part of the produce than the Irish potatoes they keep for home consumption (Nyikai, 2003; Pingali *et al*., 2005). Therefore, the increase in farm size of respondent will add to the yield of Irish potato.

Seed and agrochemical: These are important inputs that determine the yield of Irish potatoes. Since there is no any company in Tanzania that produce certified improved seed for Irish potatoes (Rahko, 2011) there are varieties of seeds which are prepared locally by Irish potato growers. On the side of agrochemicals, pesticide and fungicide are highly important in controlling Irish potatoes diseases. It is expected that farmers who use agrochemicals in Irish potatoes production to have high yield.

Dummy variables (access to extension services and credit): Access to extension services and credit were predicted to enable farmers to access appropriate technology that can boost production. Therefore, farmers who have access to extension service and credit are in a better position to increase farm productivity than those who do not have. The farmers who have access to credit were expected to have high yield because Irish potato is a capital intensive crop.

3.8.2 Analysis of marketing channels

The analysis of Irish potatoes market structure and its distribution (channels) was done using descriptive statistics such as means, frequencies and percentages in order to determine

the movement of Irish potatoes from the point of production to the point of consumption. This was done by looking into various market functionaries and their roles in producing Irish potatoes in time. Respondents were asked to mention the market centre for Irish potatoes, type of customers, means of transportation and cost associated with marketing of Irish potatoes. The effectiveness of Irish potatoes marketing channels was assessed by considering the different services that the channels offer in the market in order to maximize consumer satisfaction. Some of these included: assembling; distribution (exchange functions); storage; transport; (physical functions); grading and financing; (facilitating functions).

3.8.3 Marketing margins analysis

Market margins were calculated for various participants in the marketing chain. The margins were calculated by finding the price variations at different segments and by comparing them with the final price paid by the consumer. The consumer price was the base or the common denominator for all marketing margins. The Total Gross Marketing Margin (TGMM) is always related to the final price or the price paid by the end consumer and then expressed as a percentage (Mendoza, 1995). The net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary net income and was obtained once the marketing costs have been deducted. The producer margin were also estimated by introducing the idea of 'farmer's portion', or 'producer's gross margin' (GMMp) which is the portion of the price paid by the consumer that goes to the producer. Therefore, marketing margins at different segments were calculated as follows:-

Mathematical specification of Marketing Margin

$$TGMM=\frac{\text{End buyer price} - \text{First seller price}}{\text{End buyer price (consumer' price)}} X100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$TGMM_{RA}$=Rural assemblers price-Farm gate price……..…..…....…… (4)
End buyer price (consumers' price)

$TGMM_{w}$=Wholesale price-Rural assemblers price X100…….……...…… (5)
End buyer (consumers' price)

$TGMM_{R}$=Retailing price-wholesale Price X 100…….…….……..…….... (6)
End buyer price (consumers' price)

GMM_{P}= 100%-TGMM

NMM=Gross marketing margin-Marketing cost.

Where:

TGMM: is total gross marketing margin

$TGMM_{RA:}$ is the percentage of the total gross marketing margin received by the rural assemblers.

$TGMM_{w:}$ is the percentage of the total gross marketing margin received by the wholesalers.

$TGMM_{R:}$ is the percentage of the total gross marketing margin received by the retailer.

GMMp: is producers' share of the consumer price.

NMM: is Net Market Margin.

3.9 Limitations of the Study

In the course of conducting the fieldwork, the study encountered a number of challenges. In some occasions respondents were not able to give the correct records of their Irish potato production, prices and earnings because of lack of record keeping. The responses of interviewees were based on their memory and hence faced the problem of memory recall on data. Other problems faced by the respondents were difficulties to estimate research variables like farm size because farmers tend to mix units like acre and hectares, and

conversion of local measurements like bags, tins and traditional basket, to metric measures (kilograms or tons. However, different techniques were used to reduce the challenges. These include using different techniques (triangulation) in asking questions to get required information correctly. Also, personal observations and information from personal communication with farmers and traders complemented the information obtained from the household survey.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Producers' Household Heads

4.1.1 Age of the respondents

The findings as presented in Table 2 shows that more than half (56%) and (70%) of the respondents in Mbulu and Babati districts respectively aged between 21-40 years. Other respondents aged between 41-60 (33% and 30%) from Mbulu and Babati respectively while only 3% and 8% of the respondents from Mbulu aged below 20 years and above 60 years respectively. These findings show that most of the respondents were of the middle age, the age at which people are still energetic and hence can actively be involved in crop production activities (Lupilya, 2007). It is also expected that this group can easily adopt improved technologies because they are active in accessing information related to inputs of Irish potatoes hence improvement of yield.

4.1.2 Sex of the respondents

The sex of the respondents as presented in Table 2 shows that, 80% and 72% of the respondents in Mbulu and Babati districts respectively, were men. This indicates that most of the households were led by men and they were the ones who participate more in Irish potatoes farming activities in the study area. These results concur with other studies that show patriarchy system in many African societies have resulted into most of households being headed by men (Duze and Mohammed, 2006; Kisinza *et al.,* 2008). Moreover, the reports of Kaaria *et al*. (2007) and World Bank, (2009) show that when a crop is commercialized, men pay more attention in farming activities while women were left at home to take care of the family and other activities.

Table 2: Socio-economic characteristics of the producers

Variable	Mbulu (n=40)		Babati (n=40)	
Characteristics	**Frequency**	**Percent**	**Frequency**	**Percent**
Age(years)				
<20	1	3	-	-
21-40	23	56	28	70
41-60	13	33	12	30
61<	3	8		
Sex				
Male	32	80	29	72
Female	8	20	11	28
Marital status				
Married	31	77	32	80
Single	8	20	5	12
Separated	1	3	1	3
Divorced			2	5
Members of house hold				
<4	5	13	13	33
5-10	29	73	18	45
10<	6	14	9	22
Level of Education				
No formal education	7	18	4	10
Primary education	30	74	29	72
Secondary education	3	8	7	18

4.1.3 Marital status of the respondents

The findings on marital status as presented in Table 2 show that more than three quarters (77%) and (80%) of the respondents in Mbulu and Babati districts respectively were married, while the rest were single, widowed or separated. Marital status has implication on

social organization and economic activities such as agriculture and resource management. Married people in the study area were found to participate actively in Irish potato farming activities than single women that account for 20% and 12% of the respondents from Mbulu and Babati districts respectively. This can be due to family responsibilities as observed by World Bank (2009).

4.1.4 Education level of the respondents

The farmer's level of education as presented in Table 2 show that 74% of the respondents from Mbulu and 72% from Babati completed primary education. Education has an implication in farming activities whereby low level of education could be an obstacle to farmers to make improvements in production. This can be due to poor knowledge on the use of improved technologies such as fertilizers and agrochemicals or even informing farmers' cooperative groups (Namwata *et al*., 2010). Primary education is a good literacy level and hence it is expected that educated farmers have a good ability to process information related to Irish potato production from extension officers and agrochemical traders or dealers (Deshmukh *et al.,* 2007, Junge *et al.,* 2009).

4.1.5 Household size of respondents

The findings on household show that 73% and 45% of the respondents from Mbulu and Babati districts respectively had household sizes ranging between 5 and 10 members, with the average household size of 5.2 persons per household (Table 2). This range of household size is slightly higher than the national average household size of 4.8 persons as well as the districts average of 4.0 (THBS, 2012). Extended family is one of the factors that contribute to increase house hold size of the families. These results show that there is significant number of people in a family that provide labour in Irish potato production which reduce cost for farm activities in a family (Okoedo-Okojie and Onemolease, 2009).

4.2 Factors Affecting Production of Irish Potato in Mbulu and Babati Districts

4.2.1 Common diseases attacking Irish potatoes in the study area

The main chronic and stubborn Irish potato diseases of economic importance mentioned by 47% and 45% of the respondents from Mbulu and Babati districts respectively were potato blight and bacteria wilt. Bacteria wilt was found to have no specific means of controlling it apart from uprooting the infected plants. It was also found that some farmers use fungicides for controlling bacteria wilt but it was not effective. These findings are in line with findings by Mureithi, (2000); Otipa *et al*. (2003); Kaguongo *et al*. (2008) who reported that bacteria wilt is considered to be more problematic than potato blight because the disease has no any chemical control procedures and many farmers do not know how to control it. However, this does not mean that potato blight is not a dangerous disease. Potato blight was also found to be a dangerous disease for Irish potatoes in the study area. The results show that 22% and 25% of the respondents from Mbulu and Babati districts respectively had the problem in controlling the disease (Table 3). The study conducted by FAO (2008) indicated that if potato blight is not controlled well during rainy season it can lead to 100% loss of the crop. Therefore in order to reduce the degree of losses farmers in the study area tend to plant Irish potato when the land is dry.

Furthermore, the findings show that agrochemicals such as pesticides and fungicides have been used by 60% and 85% of the respondents from Mbulu and Babati districts respectively to control Irish potatoes diseases (Table 3). Different studies have reported that most of Irish potato growers use pesticides and fungicides in controlling diseases (Kabungo, 2008; Namwata *et al*., 2010; Maganga, 2012). It can be noted that farmers in Babati District had high access to agrochemical because of good infrastructure particularly road than farmers in Mbulu in the study area who are in very remote areas.

Table 3: Factors affecting production of Irish potatoes in Mbulu and Babati districts

	Mbulu		Babati	
Factors/Problem	**Frequency**	**Percent**	**Frequency**	**Percent**
Disease	20	50	18	45
No improved seed	7	18	9	23
Lack of extension services	5	12	7	18
Inputs are not available and expensive	8	20	6	14
Common disease(s)				
Bacteria Wilt	12	30	12	30
Potato Blight	9	22	10	25
Both Bacteria and Blight	19	48	18	45
Type of seed used				
Rongai	3	8	5	12
Farm	-	-	2	5
Local seed (Iraqw)	31	78	-	-
Mixture of seeds	6	14	33	83
Access to extension services				
Yes	3	8	7	18
No	37	92	33	82
The use of agrochemicals				
Yes	24	60	34	85
No	16	40	6	15

4.2.2 Lack of improved seed

The findings show that 18% and 23% of the respondents from Mbulu and Babati districts respectively reported lack of certified improved seed as a problem in improving Irish potato production in the area (Table 3). The common seed used in the area are local seed known as 'Iraqw', Rongai and Farm. Rongai and Farm are considered to be improved seeds and have higher yield than the local one (Iraqw). During personal communication with Selestine, (2013) about the source of Irish potato seeds, it was observed that in 1995 Farm Africa

introduced a certain improved seed at Bashnet in Babati District. The local people named it 'Farm'. The variety now is about to disappear due to mixed farming practise. Furthermore, the farmers reported that the variety of Rongai is mostly available at Arusha and West Kilimanjaro and it requires individual farmer's effort to get it. The farmers (Gadiye, 2013) reported Rongai is the most trusted seed for high yield. Inadequate supply of certified improved seeds was reported in many parts in Developing countries, that is why farmers depend on informal seed sources (farm-saved, local markets or neighbours) (Kaguongo *et al.,* 2008; Muthoni and Nyamongo, 2009). The results in Table 3 also show that the types of the seed used in this study area. The findings indicate that, 78% of the respondents from Mbulu use local (Iraqw) seed which is locally prepared in the farmers stock, whereas 83% of the respondents from Babati use Rongai, Farm and local seeds (Table 3). The choice of variety to grow by farmer is determined by its availability, knowledge about the source and preference in terms of yield.

4.2.3 Inadequate extension services

The findings show that, access to extension services for farmers of Mbulu and Babati districts is a serious problem. That is why only 12% and 18% of the respondents from Mbulu and Babati districts respectively had access to extension services (Table 3). This means that more than 80% of the respondents in both districts were not getting any extension services from extension officers. Agrochemical trades were found to be very important in giving farmers advice on the use of inputs on Irish potato production (Namwata *et al.,* 2010). The survey shows that most of the respondents from Mbulu get this service from this group. This reflects that farmers from this area lack the knowledge on Irish potatoes production from official professional extension officers. It is therefore reasonable to argue that the government should deploy extension officers to the study area in order to improve agricultural production.

4.2.4 High price and unavailability of inputs

The findings presented in Table 3 show that 20% and 14% of the respondents from Mbulu and Babati districts respectively concedes price and availability of inputs specifically agrochemicals to be a serious problem. The problem is more serious in Mbulu particularly in Murray Ward due to the remoteness of the area and poor infrastructure specifically roads. During personal communication with the farmers it was found that, there are no any subsidies for agrochemicals except fertilizer. However, the demand for agrochemicals is higher than fertilizer in the area, as the findings show that 60% and 85% of the respondents from Mbulu and Babati districts respectively used agrochemicals and none of them used inorganic fertilizer. Farm yard manure was the very common fertilizer used in the area. High price and unavailability for inputs has been reported as the main impediment in improving Irish potato production (Kabungo, 2008).

The findings also show that farmers from Mbulu and Babati districts use manure instead of inorganic fertilizer. The main reason given by most (80% and 95%) of the respondents from Mbulu and Babati districts respectively was that there was no need for using inorganic fertilizer because inorganic fertilizer reduced soil fertility (Table 3). They also claimed that farm yard manure is available in the area, cheap and easy to apply. This was proved during personal communication when one of the respondents said *"...we do not need to use inorganic fertilizer because our land has enough fertility; we just use manure to add fertility. If we use inorganic fertilizer it will cost us because once you use it you have to use it continuously because inorganic fertilizer reduces soil fertility. Therefore, we do not want it, manure is enough for us and it is costless since we just take it from our cattle shed..."* (A farmer from Bashnet Ward in Babati District).

It can be argued that the habit of not applying inorganic fertilizer among the farmers in the study area is due to inadequate extension services that were expected to give the farmers knowledge on the important of applying fertilizer. Therefore, lack of knowledge on

application of fertilizer can be said to be as the one of the factors that contributes to poor production of Irish potato in the study area. This observation agree with the study conducted by other scholars who observed low agricultural yield for smallholders farmers were contributed by poor adoption of improved agricultural technologies (Salasya *et al.,* 2007; Omoregbee and Okoedo-Okojie, 2008).

4.2.5 Other factors that affect production of Irish potatoes

There are others factors which respondents did not mention them when asked on the challenges facing them in Irish potato production that were observed as among the hindrance to Irish potato production. When the respondents were asked to give their view on access to credit, availably of land for Irish potato production, availability of labour and farmers association and others sources of income, the findings indicate that these problems influence low production of Irish potatoes in the study area. The study conducted by Kabungo (2008) reported these as among the impediments in Irish potatoes production in Mbeya.

4.2.5.1 Access to credit

The findings presented in Table 4 shows that very few (8% and 22%) of the respondents had access to credit facilities. Saving and Credit Cooperatives Societies (SACCOS) and Village Community Based Association (VICOBA) were the only important sources of financial services for farmers in this study area. When respondents were asked about access to loans from big financial institutions like banks, all of them reported that it is very difficult for them to get loans from banks. Lyatuu (1994) reported that, in spite of the importance of financial institutions to small farmers, only five smallholder farmers get agricultural credit out of one thousands farmers. Credit institutions are not accessible to small farmers because it is difficult to deal with smallholders mainly due to lack of adequate

collateral, high incidence of default and administrative costs associated with management of small loans. Lack of access to financial services particularly to fund crop production is one of the limiting factors that slow down input use in production hence low yield. These findings are similar with those of Eze *et al.* (2006); Junge *et al.* (2009) who argue that lack of accessibility to credit services to smallholder farmers was among the important limiting factors in increasing agricultural productivity in Nigeria.

Table 4: Other factors causing low production of Irish potato

	Mbulu		Babati	
Factors	**Frequency**	**Percent**	**Frequency**	**Percent**
Access to credit				
Yes	3	8	9	22
No	37	92	31	78
Source of labour				
Family	20	50	-	-
Hired	2	5	6	15
Family and hired	18	45	34	85
Source of Income				
Sales of Irish potato	9	22	28	70
Sales of livestock	16	40	7	17
petty business	2	5	1	3
Sales of garlic	13	33	4	10

4.2.5.2 Labour for Irish potato production

The findings show that 50% of the respondents from Mbulu District depend on family labour only as their main source of labour for Irish potato production while 85% of the respondents from Babati District depend on both family and hired labour (Table 4). The findings show that farmers in Babati use more hired labour than those from Mbulu because production of Irish potato in this area is higher compared to Mbulu therefore more labour is required to support family members.

The findings further show that hired labour was more important during harvesting period than other periods because the marketing of the crop is done in the field (Table 4). Not only that but also harvesting of Irish potato is more laborious, time consuming and expensive because the work is done manually by using stick or hoe in order to avoid damaging of the crop. Maganga *et al.* (2012) reported that when Irish potato is injured by cuts, it rotes easily therefore the crop become unmarketable and unfit for human consumption. During personal communication one of the respondents said*; "...during harvesting time hired labours are very scarce and expensive*. *Therefore family members are mostly used to facilitate the work and to reduce the cost."*(Ombay Qwarey a respondent from Bashnet Ward in Babati District, 2013). The use of family members in farming activities is very common in most of the African societies due to farmers' low income. Therefore, family labour is used to reduce production cost (Mwakaje, 2010; Okoedo-Okojie and Onemolease, 2009).

4.2.5.3 Lack of Irish potato growers association

Membership to an organization (*i.e*. Cooperative membership) is an important source of information among farmers. Farmers can get information about the use of modern technology and good farming practices through cooperative membership hence, improvement of production (Magang*a et al.,* 2012; Agwu *et al.,* 2008). Farmers' associations are also important in increasing bargaining power on the selling prices of crops (Quaye and Kanda, 2004). However, findings from this study show that there were no any farmers' organizations (*i.e*. farmers groups) that provide support to Irish potato growers in the study area. This problem can be due to absence of agricultural extension officers in the area who were expected to educate farmers on the importance of farmers' organization. Therefore, the absences of farmers group indicate that the potential of social-network

(social capital) through farmers group as source of agricultural related information has not been utilized in the area.

4.2.5.4 Alternative sources of income

The findings on alternative source income as presented in Table 4 show that the main occupation of the respondents in Mbulu and Babati districts is agricultural activities. None of the respondents was employed. When the respondents were asked about their main source of income, 40% of the respondents from Mbulu mentioned selling of livestock while 70% of respondents from Babati mentioned Irish potato. The farmers of Bashnet in Babati were more encouraged with Irish potato production because the area is close to Arusha and Singida road. Therefore, they are assured of the market. Also they have better access to inputs such as agrochemical because of presence of transport compared to farmers in Arri and Murray in Mbulu.

Another factor that makes Mbulu farmers especially famers' from Arri, to produce low Irish potato is cultivation of garlic. Farmers in this area divide their land in two parts: one for garlic cultivation and the other for Irish potato, this leads competition for land between the two crops. It was also observed that garlic is more produced because the crop can be stored for a long time and it is more profitable compared to Irish potatoes. The average yield of the crop is 18 bags/acre and its price range from TZS 200 000 to TZS 300 000 per bag whereby the highest yield of Irish potato is 40bags/acre but its price range from TZS 50 000 to TZS 55 000 per bag. The other source of income of farmers in the study area was the selling of livestock. This was found to be an important source of income due to the fact that indigenous people are pastoralist. It is widely acknowledged that agriculture alone cannot provide sufficient livelihood opportunities for the rural people (Craig *et al*., 2001). That why the present study tried to identify non-farm sources of income such as petty business.

4.2.5.5 Shortage of land for Irish potato production

The survey show that the average land allocated for Irish potato in Mbulu and Babati was 0.2 and 0.4 hectares respectively. This was expected due to scarcity of land in the study area. The topography of this study area is mountainous; therefore some areas are unfit for crop production. This situation forced the available land to be divided into small plots for farmers to cultivate various crops like food crops and cash crops. Food crops cultivated in this area are maize, beans and sweet potatoes. The common cash crops grown in the area are garlic and Irish potatoes. Apart from crop production there are some areas which are set aside for raring livestock like cattle, goats and sheep. These findings are in line with the study conducted by Wolter (2008); Sokoni (2008) that showed shortage of land was a problem in many part of Tanzania thus smallholder farmers grow on small areas that range from 0.3 to 0.9 hectares.

Apart from shortage of land for Irish potato production, there are other factors that cause farmers in Mbulu to allocate small portion of land for Irish potato production. Among them is the remoteness of the area. Most of the villages in this district are very far from potential market centres and have poor transport infrastructure. Due to this situation farmers opted to produce more maize and garlic than Irish potato. Maize is produced mainly by the farmers from Murray while farmers from Arri preferred to produce garlic. Farmers from this area prefer to produce these crops because maize and garlic do not require a lot of inputs as compared to Irish potatoes. Also maize and garlic can be stored for longer time compared to Irish potatoes, which is highly perishable (Kabungo, 2008; Mpogole *et al*., 2012). In order to solve the problem of land shortage some of the farmers tended to rent land from other farmers.

4.3 Factors Affecting Production of Irish Potatoes in Mbulu and Babati districts

Multiple Linear Regression analysis was carried out to identify factors affecting production of Irish potatoes in Mbulu and Babati districts. The results show that, some variables had significant influence on yield of Irish potatoes where as some have no any influence on yield (Table 5). The results in Table 5 show that 89% of the variation in yield of Irish potatoes can be explained by the variables included in the model. The findings show that age of household head in Irish potatoes production is statistically significant influencing yield of Irish potatoes at (P<0.00). A unit increase in age of Irish potatoes producer increased 0.023 tones/ha of Irish potatoes. This implies that aged farmers have higher chances of getting larger gross margin than young ones. It is commonly known that age is used as a sign of farming and marketing experience (Luh, 1995; Mpogole, 2012).

Table 5: Multiple Linear Regression analysis for factors affecting production

Variable	Coefficient	Standard Error	T-Value
(Constant)	0.031	0.235	0.132
Sex	-0.055	0.102	-0.538
Age	0.023***	0.006	3.875
Household size	0.010	0.020	0.513
Experience	0.006	0.010	0.634
Farm size	-0.011**	0.004	-2.789
Access to Extension services	0.731***	0.126	5.782
Improved seed	0.205	0.113	1.819
Inputs	0.775***	0.120	6.442

R^2= 0.89.The ** and *** indicate significance at 5% and 1% probability levels, respectively

Furthermore, the results from regression analysis show that the variable farm size was statistically significant at (p<0.01). However, this variable has a negative relationship to yield of Irish potatoes. The results in Table 5 show that for every unit increase of farm size there is a decrease of 0.011 tones/ha of the yield of Irish potatoes. The implication of this is

that farmers who allocated large pieces of land for Irish potato production have low yields than those who have small portions, because small farms generally make more efficient use of resources than large farms. However this factor can be applicable if all other factors of production like fertilizer, labour and capital remain constant. These findings support Ellis, (1988); Schumacher, (1989) who reported that the gross output of land for a small farm has been shown to be higher than that of a bigger farm,

Access to inputs especially agrochemicals was statistically significant at ($P<0.000$) and have positive coefficient to yield of Irish potatoes produced as shown in Table 6. This indicates that increased investment on agrochemicals in Irish potatoes production in the study area influence increasing of crop yield. Therefore, agrochemicals are very important in increasing yield of Irish potatoes although there are some diseases like bacteria wilt that have no any chemical control. During personal communication the farmers reported that they use ash and ant fungus to treat bacteria wilt.

Another factor that supports the respondents' argument on factors affecting them in Irish potato production is access to extension services. The findings on Table 5 show that, access to extension services is positive and statistically significant in influencing yield of Irish potatoes at ($P<0.00$). The positive association with extension services implies that there is a relationship between the service provided by extension officers and yield of Irish potatoes. Extension officers have important role in giving farmers advice on the proper use of inputs and good method of farming according to the geographical location. Since the variable has positive sign it means that the more the agricultural officers were close to farmers the more farmers were able to increase the outputs. The study conducted by Kiani *et al.* (2008) revealed that an extension service has positive and significant impact on the yield of crop.

4.4 Yield of Irish Potato per Hectare in the Study Area

The results on yield per hectare in the study area show a great variation between the two districts (Table 6). That is, farmers in Mbulu harvest on average 1.5 tones/ha while farmers in Babati harvest on average 2.3 tones/ha. These findings are different from those of Okoboi (2001) and Kabungo (2008) who reported an average yield of 3.9 tones/ha in the Southern Highlands. This great difference in yield could be due to a number of reasons including, levels of farm inputs application, planting time (early or late), and soil fertility. Other reasons mentioned by the respondents were type of seeds used and ability to control pests and wilting.

These findings can concur with the study done by Gildemacher *et al*. (2009) that explained the low yield of Irish potato produced is credited to diseases, pests and poor quality of seeds used. The study conducted by Namwata *et al*. (2008) show that farmers in Southern Highlands used improved seed like Kikondo (CIP 720050), Bulongwa, Sesamua, Baraka and Malawi. Other studies by Okoboi (2001) and Kabungo (2008) also show inorganic fertilizer is highly used by these farmers. It is assumed that the difference in the use of improved seed and application of fertilizer are among of the factors that contribute in the great difference in Irish potatoes yield between the farmers in Southern highland and farmers from Mbulu and Babati Districts.

Table 6: Yield of Irish potato per hectare in Mbulu and Babati Districts

	Mbulu			Babati		
Variable	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
Bags produced per	1.6	20.8	9.4	10	24	15.8
Individual production	**Frequency**	**Percent**		**Frequency**	**Percent**	
<10 bags	21	53		-	-	
11-20 bags	13	33		31	78	
21< bags	6	15		9	23	

4.5 Marketing Aspects

4.5.1 General characteristics of sampled traders

The findings as presented in Table 7 show that, 80% and 75% of the respondents in Mbulu and Babati districts respectively were aged between 20 - 40 years. These results indicate that, the youth in Mbulu were more involved in Irish potato business than Babati. This is due to long distance to market centre hence it is assumed that the youth are more capable in searching for markets than the elders. The findings of this study also show that 75% and 70% of traders interviewed in Mbulu and Babati districts respectively were women. However, this significant proportion of women was found to participate more in retailing and cooking vendor business while men were more concentrated in assembling or wholesale. WorldBank (2002) reported that when production, marketing and trading have been least affected by commercialization and industrialization, women tend to participate more than men.

Table 7: Characteristics of Irish potato traders in Babati and Mbulu Districts

Variable	Mbulu		Babati	
	Frequency	Percent	Frequency	Percent
Age				
20-40	16	80	15	75
41 above	4	20	5	25
Sex				
Male	5	25	6	30
Female	15	75	14	70
Level of education				
No education	3	15	-	-
Primary education	17	85	18	90
Secondary education	-	-	2	10
Marital status				
Married	2	10	4	20
Single	15	75	12	60
Divorced	1	5	2	10
Widow	2	10	2	10

The findings also show level of education of the respondents in the study area. The majority (85% and 90%) of the respondents in both districts (Mbulu and Babati) respectively had primary school level of education with only a minority who had secondary education qualification (Table 7). Low level of education among the respondents is among the factors that hinder small traders from getting opportunities in conducting the business effectively and ability to bargain on the selling prices. Pingali *et al*. (2005) reported that most farmers and traders have low bargaining power due to low level of education.

The findings on marital status as indicated in Table 7 show that trading activities of Irish potato in this area were mostly performed by unmarried traders and particularly women. As mentioned earlier, women are the one who participate more than men. The reason why unmarried women participated more was observed during personal communication when one of the respondents said *"...According to our culture (Iraqw culture), a husband cannot allow his wife to do business because they believe the work of married women is to take care of the family and livestock, doing business is regarded as prostitution, that is why most of the women who did business were either single or separated" (*Anna Tluway a business woman from Mbulu). Cultural differences between Southern Highlands people and people in Mbulu and Babati districts make this findings to contradict the results reported by Kambungo, (2008); Mpogole *et al*. (2012) and Nyunza and Mwakaje, (2012) on women involved in Irish potato trading in Southern Highlands being done mainly by married women.

4.5.2 Irish potato business centre in Mbulu and Babati Districts

The results from this study as shown in Table 8 indicate that there is no big market for Irish potato in the study area, except district market. District market act as the main market centre for the Irish potato producers particularly for the farmers in Mbulu. The findings show that

more than half (60%) of the respondents from Arri and Murray in Mbulu District sent their produce to Mbulu District Market (Table 8). The rest sold to Karatu and Babati District market and Arusha.

Table 8: Irish potato business in Mbulu and Babati Districts

	Mbulu		Babati	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Market for Irish Potato				
Mbulu District market	12	60	-	-
Karatu District market	2	10	-	-
Babati District market	4	20	7	35
Arusha	2	10	10	50
Singida	-	-	3	15

The findings show that 50% of the traders from Bashnet in Babati sold their produce to the markets in Arusha and Singida regions and others to district market (Table 8). It should be noted that the supply of Irish potatoes from Mbulu and Babati districts is very low; therefore, its market was within the district and nearby region. Consequently Irish potatoes from Southern Highlands are important in the country for sale in major cities in the country. Although, sales of Irish potatoes in Mbulu and Babati districts were conducted twice in a year its supply is low compared to Irish potatoes supplied in Southern highland.

4.5.3 Source of capital for Irish potato traders

Source of capital for Irish potato traders in Mbulu and Babati districts are presented in Table 9. The findings show that 88% and 78% of the respondents from Mbulu and Babati districts respectively their main source of capital for Irish potatoes business was personal saving (Table 9). That is 10% and 15% of the respondents from Mbulu and Babati districts

respectively depended on grants from parents, relative and friends and 2% and 7% of the respondents from Mbulu and Babati districts respectively depended on credit from groups and SACCOS (Table 9).

Table 9: Source of capital for Irish potatoes trading

	Mbulu		Babati	
Source of capital	**Frequency**	**Percent**	**Frequency**	**Percent**
Personal saving	35	88	31	78
Parents and relatives/friends	4	10	6	15
Credit	1	2	3	7

4.5.4 Market information

The findings related to marketing information as presented in Table 10 show that, 60% and 80% of the respondents from Mbulu and Babati districts respectively had no problems in getting market information. The results of the respondents on kind of information which is more accessible show, 93% and 83% of the respondents in the two districts mentioned price of Irish potato. Babati District is more accessible for traders due to availability of transportation and telecommunication system thus it is not surprising for many farmers in this area to get market information easily than farmers from Mbulu. The major source of information mentioned was traders and cellular phones. Agwu *et al. (*2008), Odoemenem and Obinne (2010) claimed that, farmers' organization membership is the major source of information related to inputs and price of product. However, in this study area there was no any farmers organization thus each individual famer had his/her own source of information.

Table 10: Irish potato market information

Variable	Mbulu		Babati	
	Frequency	Percent	Frequency	Percent
Access to market information				
Yes	24	60	32	80
No	16	40	8	20
Kind of information				
Price of Irish potato	37	93	33	83
Price of inputs	3	8	7	18
Source of information				
Traders	29	73	31	78
Neighbours	4	10	5	13
Friends and relatives	7	18	4	10

4.5.5 Factors affecting marketing of Irish potatoes in Mbulu and Babati districts

4.5.5.1 Poor infrastructure

The findings on factors affecting marketing of Irish potatoes in Mbulu and Babati districts are indicated in Table 11. The findings show that 28% and 23% of the respondents from Mbulu and Babati districts respectively had the problem on transporting their produce due to poor infrastructure especially roads (Table 11). Most of the producers in the study area were residing deep in the villages where feeder roads are poor and in some areas did not exist, this situation make it difficulty not only in transportation but also in transportation costs to and from the collection centers to both buyers and farmers. Wholesalers and village assemblers were the one who suffered from this cost because buying process was usually conducted directly from the field mainly because farmers do not have means to transport the crop to the collection centre. Therefore, traders use middlemen to visit several farms in order to fill their vehicles. Akintomide and Antai (2012) and Rahko (2011) also reported similar finding that claim poor infrastructure as one of the factor that lead to increase market cost such as, the cost of transport from area of surplus production to distant markets.

Table 11: Factors affecting marketing of Irish potatoes

	Mbulu		Babati	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Poor infrastructure	15	38	12	30
Perishability	20	50	22	55
Lack of unified standard unit	5	12	6	15
Harvesting technologies				
Stick use	36	90	33	83
Hand hoe	4	10	7	17

4.5.5.2 Perishability of the crop and storage facilities

The findings on marketing problems related to perishability and storage facilities of Irish potatoes show that 47% and 53% of the respondents from Mbulu and Babati districts respectively face the problem of perishability of the product in trading process. Limited on-farm storage facilities were one of the factors that lead farmers to sell their produce direct from the field. The survey shows that big farmers harvest the produce when they are sure of the buyers. This is because farmers do not store potatoes but sell directly from the field leading to surplus periods, depressed prices and correspondingly low net returns to them. Therefore, on-farm storage of potatoes can help in price leveling assuming that lack of appropriate storage rather than immediate cash needs is the main reason for selling potatoes straight from the field. Furthermore, the findings show that none of the trader has cold storage facilities during transportation. Therefore, due to this situation most of traders buy the product from the farmers when they were sure of the markets. Sometimes in order to reduce the risk of damaging of the products farmers and trades keep their products on the floor in the house when selling. Ferris *et al*., (2003) argue that Irish potatoes farmers and traders sell their produce for uncompetitive price due to perishability of the product.

4.5.5.3 Lack of unified standard unit for Irish potato

The findings presented on Table 11 show that 20% and 17% of the respondents from Mbulu and Babati districts mentioned lack of unified standards as one of the main problems in

trading of Irish potatoes. Selling and buying of Irish potatoes in the study area was usually done by using bags and not weights. Farmers used to pack Irish potatoes in extended bags (*rumbesa*) as such they were sometimes unable to know the actual amount they pack in the bag. The average weights of one extended bag range from 140 to 200kg. The survey show that farmers have no knowledge on the weights instead they count the number of tin in a bag. There are bags that contain 7 tins and other take 10 tins. The average weight of one tin was 20kg. Therefore, the farmer has no chance to argue on the amount needed to fill the bag instead the size of the bag determine the amount of the Irish potatoes to be filled. Similar findings from (Muthoni and Nyamongo, 2009, Kaguongo *et al.* 2008) show that farmers fill Irish potatoes in extended bags instead of using a standard bag of 100-110kg.

4.5.5.4 Poor harvesting technologies

Poor harvesting tools were found to be a problem in marketing Irish potatoes due to the fact that, a large percentage of the product was lost by the farmers due to the damaged product. The damaged products are unwanted in the market because they are unfit for consumption and also they cause good product get rotten fast when they were mixed together. The findings on the tools used during harvesting show that 90% and 83% of the respondents from Mbulu and Babati districts respectively used stick in harvesting while 10% and 17% of the respondents from Mbulu and Babati districts respectively use hand hoe (Table 11). All of these tools are not good in harvesting Irish potatoes because the probability of damaging the product by the use of these tools is high. The study conducted by Mugisha *et al.* (2010) show that 25-30% of Irish potatoes damaged during harvesting was due to poor harvesting technologies. The survey shows that farmers have no habit of sorting rotten or cut Irish potatoes with good one during selling. This habit reduced the shelf life and qualities of Irish potatoes hence cause loss to traders.

4.5.6 Irish potatoes price determination and price setting strategy

4.5.6.1 Price determination

Pricing of Irish potato like many agricultural commodities is not controlled by any external force like government and non-governmental organizations. Usually the price of the commodity in the previous market day becomes the basis for negotiation. At producer level price determination is highly depend on buyer's negotiation skill initially but once it is settled it becomes a price for a particular market day.

4.5.6.2 Price setting strategy

The survey findings revealed that producers do not have the power to set the selling price and they do not want to interfere with the price setting strategy of wholesalers. Rather, relying on the price which was set by wholesalers, but they bargain in terms of quality of Irish potatoes. The findings presented in Table 12 show selling prices of Irish potatoes at the farm gate level, wholesale level, village assembly, retail and at food vending level. The findings show that the average farm gate price of Irish potato was TZS 45 875 and TZS 50 000 per 140kg in Mbulu and Babati district respectively (Table 12). The prices vary depending on the variety and quality of Irish potatoes, season and the buyer is involved. All the respondents reported that the mode of payment at farm gate was purely cash and carry.

Table 12: Price (TZS) Analysis per 140kg at Farm gate level

	Mbulu			Babati		
Agent	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
Producer	30 000	50 000	45 875	40 000	60 000	50 000
Wholesaler/Assembler	55 000	80 000	68 571	60 000	90 000	74 500
Retailer	60 000	90000	75833	65 000	98 000	81333
Food vendor	60 000	140 000	83 333	70 000	140 000	96 667

The average selling price of Irish potatoes for wholesaler/assemblers at Babati, Karatu, Arusha and Singida market ranged between TZS 68 571 and TZS 74 500 per 140 kg. This was reported by Bukhay, (2013) during personal communication. Furthermore, the findings shown in Table 11 also shows Irish potatoes average prices for retailer and cooking vendor in the study area.

4.5.6.3 Factors considered by Irish potatoes traders in setting buying price

There were several factors considered by Irish potatoes traders in setting up buying price of Irish potatoes. The main factors considered in setting the price of Irish potatoes in Mbulu and Babati districts were based on size, quality and by considering supply and demand force. The findings show that 35%, 20%, and 45% of the respondents in Mbulu District reported size, quality and supply and demand respectively were the major factors considered in buying Irish potatoes (Table 13).

Table 13: Factors considered by Irish potatoes traders in setting buying price

	Mbulu		**Babati**	
Factors	**Frequency**	**Percent**	**Frequency**	Percent
Size	7	35	6	30
Quality	4	20	3	15
Variety	-	-	4	20
Supply force and demand force	9	45	7	35

The criteria used by 30% of the respondents in Babati District was size whereas 15% of the respondents reported quality, 20% reported variety and 35% of the respondents reported supply and demand forces. These were the major factors considered by Irish potatoes traders especially wholesalers and assemblers in setting price in the two districts. These findings concur with those of Kabungo (2008) which reported that size, quality and supply and demand force was the major criteria in setting buying and selling price of Irish potatoes.

4.5.7 Irish potato marketing channels and TGMM in Mbulu and Babati Districts

4.5.7.1 Irish potato marketing channels

The farmers in Mbulu and Babati districts produce Irish potatoes for both sale and subsistence. They sell their crop to any buyer of their choice, including retailers, food vendors, village assemblers and wholesalers who came to the field. The presence of these actors widens the marketing choices for the farmers and hence leads to the growth of potential marketing channels which in turn contributes to better prices and high gross margins (Sokoni, 2001). The choice of buyers by farmers depends on the quantity and quality of Irish potatoes produced. Most of the poor and low producer farmers sold their Irish potatoes to retailers and food vendor or fellow farmers, while big producers and rich farmers sold to wholesalers and village assemblers in the farm gate. The survey shows that rich farmers in the study area preferred to sell their produce at farm gate in order to reduce transaction cost. A study by Mwakaje (2010) argue that, when selling the crop, very few farmers were able to hire trucks to take their products directly to the big markets, but the majority sold their produce to the local traders visiting the field.

The findings on places were farmers sell Irish potatoes and major customers of Irish potatoes show that 58% and 82% of the respondents from Mbulu and Babati districts respectively sold their Irish potatoes at their farm gate (Table 14). Other farmers (27%) of the respondents from Mbulu sold their produce in Mbulu town to retailers and food vendors. These were the producers from Muray in Mbulu District who produce low quantity because of transportation problem. Farmers in this area use motorcycle, bicycles or passenger vehicles to transport their goods. Other respondents that consist 15% and 18% of the respondents from Mbulu and Babati districts respectively sold their Irish potatoes at the bus stops along the road to village assemblers (Table 14).

Table 14: Places were Irish potatoes were sold and major customers

Variable	Mbulu		Babati	
	Frequency	Percent	Frequency	Percent
Places where producers sold Irish				
On the farm	23	58	33	82
Mbulu/Babati town	11	27	-	-
To the bus stop/along the road	6	15	7	18
To whom producer sell				
Wholesaler	16	40	22	55
Assemble	7	18	6	15
Retailer	8	20	4	10
Food vendor	6	15	6	15

The findings as presented in Table 14 show that 40% and 55% of the buyers from Mbulu and Babati districts were wholesalers. Wholesalers from Babati buy the product from the farmers and transport to Babati centre or to other region like Arusha and Singida while wholesalers from Mbulu sold their produce to Babati centre and Karatu. The findings also show 18% and 15% of the buyers from Mbulu and Babati districts respectively were village assemblers who also act as a transporters (Table 14). Village assemblers buy Irish potatoes and transport it either to Babati town or Arusha and sometimes they sell to travellers or retailers along the road. The survey shows that they also collect Irish potatoes for wholesalers. Other customers of the Irish potatoes producers were retailers and food vendors. The findings show 20% and 10% of the respondents from Mbulu and Babati districts respectively were retailers (Table 14). Retailers sell their products to consumers or food vendors at the village market or along the road. Food vendors that account 15% in both Mbulu and Babati districts buy Irish potatoes from the farmers and sell to consumers in form of fried chips. The most important channels (routes) involved in the transferring of Irish potatoes in the study area are presented in Fig. 2.

***Channel I*:** Producer ⟶ consumer

***Channel II*:** Producer ⟶ food vendor ⟶ consumer

***Channel III*:** Producer ⟶ retailer ⟶ food vendor ⟶ consumer

***Channel IV*:** Producer ⟶ rural agent ⟶ village Assembler ⟶ retailer ⟶ consumer

Channel V: Producer ⟶ rural agent ⟶ village assembler ⟶ retailer ⟶ food vendor

***Channel VI*:** Producer ⟶ village assembler ⟶ wholesaler ⟶ retailer

Figure 2: Irish potato marketing channels in Mbulu and Babati districts

Generally, the marketing channel in any agricultural production involves a number of players. These players may include the farmer or producers, village traders, wholesalers, retailers and consumers or a processor (Bhajantri, 2011). Irish potato marketing channels in Mbulu and Babati districts were characterized by a number of small scale traders and wholesalers operating privately and on individual basis. The established marketing channels although informal help to facilitate the flow of Irish potatoes from producer to consumers. These actors depend on each other in order to perform well the marketing of Irish potatoes. The survey results show that there were six major channels whereby Irish potato is moved from farmers to consumer (Fig 3).

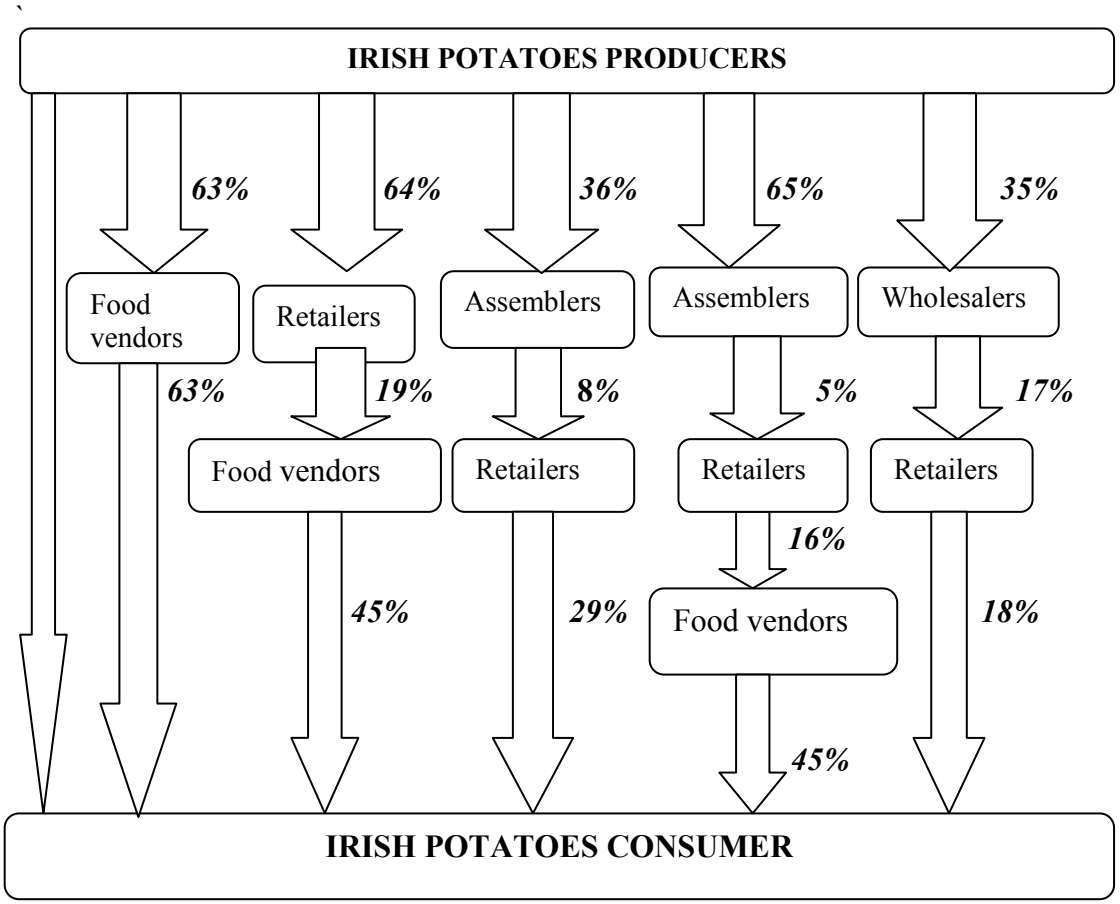

Figure 3: Irish potatoes marketing channels and TGMM

4.5.7.2 The role played by Irish potato marketing actors

Each actor had different role to play in Irish potato marketing channels. The following discussions are based on the roles of various marketing participants involved in Irish potatoes marketing channels.

Producer/Farmer

With respect to this study, the key players in Irish potato marketing chain were farmers or producers. Most of these farmers produced Irish potatoes for commercial purposes. During harvesting time farmers were responsible to search for the market with the assistance of Irish potatoes agent. Farmers harvest Irish potatoes only when a buyer provides cash in

advance and for payment of labour for packing. Selling of Irish potatoes in the study area was mostly conducted at the farm gate and on a cash basis. Wholesaler and village assemblers buy the product direct from the field and transport to other regions. Few farmers especially those who produce in small quantity transport their produce to retailer and food vendors at the market centre or to the weekly village market. Selling of Irish potatoes at farm gate level help farmers to reduce market cost especially farmers of Arri in Mbulu Districts due to poor transportation system. These findings are similar with Mwakaje (2010) report that show most of the farmers sell their produce at farm gate or at the local market due to poor transportation system.

Village assemblers

Village assemblers were another important actors found in Irish potato marketing channels in Mbulu and Babati districts. It was observed that these traders were sometime also the producers of Irish potatoes in the study area. They normally engage in business during harvesting time. Since they come from the production area their work is not too difficult because they know the Irish potatoes producers, quantity produced and when the product is likely to be harvested. Their main activities were to assemble Irish potato from different farmers and to transport to the nearest market. The trade can also be initiated with the wholesalers who required fast supplies and in few cases to retailers and food vendor. Village assemblers had no permanent place for conducting their business. Sometimes they conduct it along the road, but in most cases they pass door to door in search of Irish potatoes. Village assemblers from Mbulu District sold their product to Mbulu and Babati districts while village assemblers in Babati Districts sold their product at Babati centre and other regions like Singida and Arusha. When the respondents were asked on means of transport, none of the respondent owns a vehicle for transporting their goods. Mwakaje,

(2010) also claimed that, when selling the crops very few farmers and traders have their own transport. Most of the farmers hire trucks to transport their products to the big markets.

Village agents

Village agents were the one who link farmers and wholesalers. They act as the middle men known as brokers in other area. Village agents were responsible for informing wholesalers on farmers who are willing to sell, to negotiate a selling price and to buy the product on behalf of the wholesalers. They were also responsible for assembling the product they bought in one area particularly to the area nearby the main road where it can be easily transported. Village agent get commission per Irish potatoes bags collected for their services. The amount of the commission ranges from TZS 500-1000 per bag depending on the quantity and distance from the field. The survey shows that wholesalers still depend on urban brokers in order to sell their products. Therefore broker was a very important person for wholesaler in buying and selling his/her products. These agents sometimes make extra money when the product is bought or sold above the price agreed upon with owners (Quaye and Kanda, 2004).

Wholesalers

Irish potato wholesalers in the study area come from Bashnet in Babati District and Arusha. They come to the area during the harvesting period buy the crop and transport it to other region's market like Arusha and Singida. To facilitate their work, wholesalers employ village agents who work in the production areas to buy the product on their behalf and to collect the produce to a nearby road for ease transportation. Wholesalers have enough capital therefore purchase the crop in bulk and transport it to big markets in the urban areas and sell either to urban wholesalers or retailers. In selling their products they use urban

brokers. However, farmers who produce in large quantities are happy to sell their produce to these agents because they reduce transaction cost.

Retailers

Irish potato retailers in Mbulu and Babati districts conduct their business in small towns in the districts and along the road. Retailers usually have small capital and buy the product in small quantities and in most cases do not transport the crop to the larger markets. In the study area retailers buy two to three tins of Irish potatoes from the farmer and sell it in various heap sizes. The price of one tin that weighs 20kg from the farmer ranges from TZS 10 000 to TZS 12 000 and the price of one heap range from TZS 500-1000. The average weight of the heap sold in TZS 1000 was 1kg. Retailers could either get the product direct from the field or the producer could send the product to retailer's business centre. The major customers of Irish potatoes of the retailers' were consumers.

Food Vendors

Another actor in Irish potatoes marketing channels in Mbulu and Babati districts were food vendors. The main role of this actor in the study area was to make fried chips and sell either in front of a hotel or bar. This business was mostly performed during the night because its major customers were the travellers and bar customers. During personal communication on the sources of Irish potatoes to food vendors, it was observed that producers send Irish potatoes direct to food vendors in their business area or food vendors buy from village assemblers/retailer. This is a very important group for the producer as its demand determines the price of the Irish potatoes (Kabungo, 2008). The producers who benefit more from these actors are those who have very small plots, because they produce in small quantity, so it is not possible for the assemblers and wholesalers to go to their field since they cannot get enough products.

Consumers

The consumers were categorized into village consumers, travelling consumers and urban consumers. Village consumers eat Irish potatoes in boiled or mashed forms. This meal is mixed with either beans or meat. Urban consumers were the largest and they usually consume the crop in the form of chips. What was observed in the study area is supported by the study carried out by CIP (2001) which reported that in East Africa over 50% of Irish potatoes are processed into chips or crisps which are sold in urban hotels, restaurants and take-away (fast-food outlets). When the respondents asked on the processing of the products in different forms like flour, none of the respondents have the knowledge on that. However boiled Irish potatoes was the most popular form of consumption reported in both districts. This was the cheapest and the simplest affordable Irish potatoes meals by most people for breakfast and dinner. Fried chips were often not taken at home by most of the people but it consumed at the hotels or bars at the village centre. The survey shows that in order for a person to get satisfaction, chips should be accompanied by *mishikaki* or eggs. That is why fried chips were mostly consumed by the people of high income in the study area. It is therefore observed that boiled Irish potatoes remains the major form by which people consume Irish potatoes. In addition the consumption of Irish potato in urban area and along the highways is higher than in rural areas because in urban areas it is consumed in different form such as chips and crisps (CIP, 2001).

4.5.7.3 Irish potatoes marketing margin analysis in Mbulu and Babati districts

Market margins of key market players participated in Irish potatoes marketing channels in Mbulu and Babati districts is presented in Table 15. The marketing margin among the intermediaries depends on the price of Irish potatoes and marketing cost (Dastagiri *et al*., 2010). The actor has the opportunity of gaining higher margin than others when one

incurred low marketing cost. The key traders levels identified in market margin computation were: Farm gate, consumer, retailing, village assembly and wholesale levels. In this study producer participation contribution is computed by deducting total gross margin from 100% as shown in estimation procedure in Table 15.

The marketing margins calculated for each marketing actor show that there is a large difference in the consumers' price spread along the marketing channels. Wider marketing margin indicated high price to consumers and low price to producers and it is an indicator of the existence of imperfect markets (Cramer and Jenson, 1982) though this can be caused by many reasons. Table 15 shows total gross marketing margin was maximum (65%) in channel V followed by channel III (64%). The highest margin in these channels was due to presence of many actors in the channel including food vendors who add value to the product by making chips that make the price of the final consumer higher in this channel than other channels.

Table 15: Marketing margin analysis of Irish potato in Mbulu and Babati districts

	Market channels					
Market player	**I**	**II**	**III**	**IV**	**V**	**VI**
TGMM		63.2	64.0	36.4	65.0	34.7
GMM_P	100	36.8	36	63.6	35.0	65.3
GMM_A				8.1	4.5	16.7
GMM_R			19.4	28.5	15.6	
GMM_{cv}		63.2	44.5		44.5	
GMM_W						18.1

The lowest (35%) total gross marketing margin was in channel VI. The farmer's share of the total consumer price was 100% in the channel I, 37% in channel II, 36% in channel III, 64% in channel IV, 35% in channel V and 65% in channel VI. This suggests 63% of the

total consumer price in channel II, 64% of the total consumer price in channel III, 36% of the total consumer price in channel IV, 65% of the total consumer price in channel V and 35% of total consumer price in channel VI. This great difference between the farmers share and consumer price was due to imperfect market that exists in the study area.

The findings also show marketing margin of each Irish potatoes market player participated in Irish potatoes marketing channels. The marketing margin of one actor differs from channel to channel depending to the point and price which the actor got the product. The findings show that food vendors had 63% of total consumer price in channel II and in channel III and V had 45% of total consumer price. Retailers marketing margin in channel III, 1V and channel V were 19%, 28% and 15% of total consumer price respectively. On the side of village assemblers their marketing margin in channel IV was 8% of total consumer price, in channel V was 5% of the total consumer price and in channel VI was 17% of the total consumer price. Wholesalers were found to have 18% of the total consumer price in channel VI (Table 15).

The maximum (63%) total gross marketing margin generated in channel II goes to food vendor due to value addition to the product that makes the consumer pay high price. These big marketing margins received by different marketing actors are evidences for the existence of market inefficiencies although high marketing margins can also arise due to high real marketing costs and a very big producer and consumer price differences. There was also a great difference between the assemblers' price and final consumer price in channel V. This happens because of the presence of many actors and value addition to the product in the channel. Therefore, rural assemblers generated lower (5%) marketing margin in channel V than other actors. It has been claimed, the larger the number of participants in

the channel the lesser the marketing margin (Dastagiri *et al*., 2010). Moreover, the highest producers' share was observed in channel I of Irish potato marketing chain that account 100% out of the price paid by consumer.

4.5.8 Selling and buying prices for different marketing channels player

On average prices at different levels of market channels were based on the key market players in the study area. The findings presented in Table 16 indicate that the average producer selling price for 140kg/bag differs from one channel to another and from actor to actor. The selling price of other actors also differs from one channel to another and from one actor to another. It was also observed that these prices differ from time to time. For example in the months of November, December and January when there is scarcity of Irish potatoes in the market in different parts of the country, the price of Irish potatoes is high, about twice of the price offered during harvesting season. The harvesting and selling months for Irish potatoes in Mbulu and Babati districts were February-April and August-October. These findings are in line with Nyunza and Mwakaje, (2012) studies conducted in the Southern Highlands who reported that during harvesting period there is surplus of Irish potatoes in the markets therefore the price is low.

There were about six Irish potato marketing channels in Mbulu and Babati districts. Each actor in the channel had different sources of Irish potatoes. The findings indicated in Table 16 show selling and buying prices of Irish potatoes for different marketing channels for 140kg/bag in the channels for each group of market player.

Channel I

Channel I shows the movement of Irish potatoes from producer to consumer. In this channel consumers purchase Irish potatoes directly from producers either in farm gate or local market. Table 16 shows the average buying and selling price was TZS 54 500 per

140kg/bag. The consumers in this channel were the fellow farmers in the village or urban consumer.

Table 16: Selling and buying price for marketing channels players per 140kg

		Market channel					
Market player	**Price (TSH/140kg-Bag)**	**I**	**II**	**III**	**IV**	**V**	**VI**
Producer	Selling price	54 500	55 700	54 500	53 500	53 500	47 000
Assembler	Buying price				53 500	53 500	47 000
	Selling price				60 300	60 300	59 000
Retailer	Buying price			54 500	60 300	60 300	
	Selling price			83 900	83 000	83 900	
food vendor	Buying price		55 700	83 900		83 900	
	Selling price		151 200	151 200		151 200	
Wholesaler	Buying price						59 000
	Selling price						72 000
Consumer	Buying price	54 500	151 200	15I 200	83 900	151 200	72 000

Channel II

In this channel the main participants were producers, food vendors and the last user of the product (consumer). The findings presented in Table 16 show that there was great different between producer price and final consumer price in this channel due to value addition to the product. Food vendors average buying price from producer was TZS 55 700 while the consumer buying price from food vendor was TZS 151 200. Food vendors processed Irish potatoes in form of chips and sell it per plate that is why its selling price per 140kg/bag is

high because of the processed cost. The prices of one plate of chips range from TZS 800 to TZS 1000.

Channel III

Marketing players in channel III consist of producers, retailers and food vendors. Findings as presented in Table 16 show that retailer acquire the product from producer for TZS 54 500/= per 140kg/bag and sell it to food vendor for TZS 83 000. Retailers normally sell Irish potatoes in small heap of TZS 500-1000 or by using "sadolin" that takes 5kg for TZS 4000 or by using tin of 20kg for TZS 12 000 at the village centre or along the road. Although food vendor buy Irish potatoes at high price from retailer the price of chips per plate did not change therefore the consumer price in this channel was as same as in channel II (151 200). The presences of food vendors in this channel also make the great variation between producer and consumer price. In the study area this channel was common when there was scarcity of Irish potatoes especially on the months of November, December and January.

Channel IV

The main actors in this channel were village assemblers (Table 16). Village assemblers buy the product from the farmers and sell it to retailers using tin of 20kg for the average of TZS 8614. Village assemblers sell their collected product to retailer when they face the problem of transport or when they collect few products which are not enough to transfer to other region. Since these agents have no vehicle (Lorries) for transporting their products they usually organise themselves in group in order to share transportation cost including the cost of hiring lorry but when they get the problem in getting the hired vehicle they opt to sell their product to retailers in the local market. The farm gate price for village assemblers in this channel was TZS 53 500 and the consumer price was TZS 83 900.

Channel V

Channel V is the longest Irish potato market channel in Mbulu and Babati districts. This channel involves almost all the actors of Irish potatoes in the study area that is the producers, assemblers, retailers and food vendors. The buying price of assemblers in channel V was found to be the same price as that of channel IV (TZS 53 500) because the source of the product (farm gate price) for channel IV and V is the same. In this channel village assemblers sell their products to retailers who sell to food vendors by using "sadolin". Food vendors process the Irish potatoes in form of fried chips and sell it per plate at the hotel or bar. One "sadolin" provide 5 to 7 plates of fried chips depend to the size and type of Irish potatoes. As explained in channel II the price of one plate ranges from TZS 800 to TZS 1000. Therefore the average total price of 140kg/bag of Irish potatoes in Mbulu and Babati districts in this channel was TZS 151 200.

Channel VI

Irish potato marketing channel in channel VI involves village assemblers and wholesalers**.** In the study area village assemblers sometimes act as wholesalers' agents in buying Irish potatoes. They buy the product from the farmer and sell it to wholesalers at least at a higher price than the price of the farmer. The difference between village assemblers and village agent (brokers) was that, village assemblers use their own money to buy the product and to pay for others expenses such as collection cost while village agent just bargain the buying price with the farmer and wholesaler was the one who makes payment for the product and the collection cost. Table 16 shows that the average buying price for wholesaler from village assemblers was TZS 59 000 and the average selling price at Arusha and Singida market was TZS 72 000. In this channel the producer selling price was found to be lower (TZS 47 000) than the other channels because of the amount of the product bought from the

field. Some village assemblers/wholesalers buy the entire product from the field before harvesting without regarding the size and quality of the Irish potatoes.

4.5.9 Marketing cost and net marketing margins of actors in the marketing channel

Net marketing margins maintained by each actor in various Irish potatoes marketing channels are presented in Table 17. The net marketing margins for various marketing actors were calculated by deducting the percentage of consumer price from total gross margin of each actor. Table 17 also shows marketing charges of different actors participated in Irish potatoes marketing trade. The findings show that the retailer was the one who enjoyed the highest (27%) net marketing margin in channel IV followed by food vendor in channel II who had the net marketing margin of 25%. The lowest (1%) net marketing margin is associated with village assemblers in channel V of Irish potatoes marketing system due to inclusion of retailers and food vendors participation in the market channel (Table 17). Gebregziabher (2010) argue that net marketing margin of the players in the marketing channels decreases as the number of actors involved between the producer and last consumer increases.

The analysis show that net marketing margins of each actor differs from channel to channel. The findings as presented in Table 17 show that village assembler received 2% net marketing margin in channel IV, 1% net marketing margin in channel V and 11% net marketing margins in channel VI. The presence of retailers and food vendors in channel IV and V raises the price of final consumer hence lowered the net margin of village assemblers even though their marketing cost was low. The highest (27%) retailer's net marketing margin was found in channel IV and the lowest (13%) net marketing margin was in channel V. The retailer's net marketing margin in channel III was 15%. On other hand food vendors' net marketing margins were 25% in channel II and 9% net marketing margins in channels III and IV.

Table 17: Marketing charges (TZS) and net marketing margin per 140kg by various actors

Market player	Cost Item	Marketing channel I	II	III	IV	V	VI
Rural Assembler	Transportation				3000	3000	1000
	Storage				500	500	500
	Market toll				500	500	500
	Loading and unloading				1000	1000	1000
	Total cost				5000	5000	4000
	Total marketing costs as % of consumer price				6.0	3.3	5.6
	NMM				2.1	1.2	11.1
Retailer	Transportation			5000	-	2000	
	Storage			1000	1000	1000	
	Market toll			500	500	500	
	Handling and packaging			-		-	
	Total cost			6500	1500	3500	
	Total marketing costs as % of consumer price			4.3	1.8	2.3	
	NMM			15.1	26.7	13.3	
Food vendor	Transportation		5000	1000		1000	
	Storage		1000	1000		1000	
	Market toll		500	500		500	
	Processing cost		52 000	52 000		52 000	
	Total cost		58 500	54500		54 500	
	Total marketing costs as% of consumer price		38.7	36.0		36.0	
	NMM		24.5	8.5		8.5	
Wholesaler	Transportation						5000
	Storage						1000
	Market toll						1000
	Loading and unloading						2000
	Agent cost						1000
	Total cost						10 000
	Total marketing costs as% of consumer price						13.9
	NMM						4.2

The presence of more than one actor that is village assemblers and retailers in channels III and IV contributed to lowering net market margin of food vendors in channel III and IV. Wholesalers' participation in Irish potatoes marketing channel was observed in channel VI. Whereby the net marketing margin was 4% (Table 17). Therefore, the study findings show that producer's share and net marketing margin maintained by various chain actors varied extraordinarily across the different marketing channels. The main reason behind this was due to the number of intermediaries involved between the producer and the final consumers.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The present study aimed at analysing production and marketing of Irish potatoes in Mbulu and Babati districts so as to identify potential area for intervention in order to improve small-scale farmers' access to markets. The specific objectives of the study were: to determine factors affecting production of Irish potatoes in Mbulu and Babati districts, to describe Irish potato marketing channels in Mbulu and Babati districts and to assess Irish potato marketing margins for key marketing channels. A cross sectional single-visit survey involving farmers and traders from Muray, Imboru, Arri, Dongobesh, Madunga and Bashnet wards was conducted to represent the two districts. Descriptive Statistics, Multiple Linear Regression, market channel and market margins were used for addressing specific objectives.

The findings on factors affecting production of Irish potatoes in Mbulu and Babati districts show that, Irish potatoes yield per hectare in the study area is low although, the geographical location and arable land found in the area favours high production. There were several reasons that caused Irish potato growers in the study area to fail to capture the potential benefits of crop production. Among these are poor management and absence of chemical control measures for some disease like bacteria wilt and potato blight diseases.

In addition, lack of improved seed was also found to be among the factors that contribute to low yield of Irish potato in the study area. This was due to the fact that most of the farmers

in Mbulu District used purely traditional (Iraqw) seed prepared locally in the farm stock or bought from neighbour which has low yield compared to Rongai and Farm.

Other factors that contribute to low yield of Irish potato in Mbulu and Babati districts are lack of extension services and high price of inputs like agrochemical. The findings show that farmers from Mbulu particularly from Murray were the ones who suffered most for inadequate extension service than farmers from Babati. On the side of input like fertilizer and pesticides the findings show that none of the respondents from Mbulu (Murray) have the knowledge about it. This can also be among the factors that contribute to low production of Irish potatoes in the study area.

The findings on factors affecting marketing of Irish potatoes in Mbulu and Babati districts show that, poor infrastructure, unstandardised unit for selling Irish potatoes, perishability of the crop and poor harvesting technologies were the major factor that hinder the smooth marketing of Irish potatoes in Mbulu and Babati districts. These factors mostly affect farmer than Irish potatoes traders because most of the obstacles were at the farm level and not to the last consumer market.

The study findings show that there were about 6 marketing channels in Irish potatoes marketing systems. Market actors in Irish potatoes marketing channel were farmers, food vendors, retailers, village assemblers and wholesalers. These actors were found to play different role in different channel. Channel V was the longest channel that includes many actors in Irish potatoes marketing system. The actors were farmers, village assemblers, retailers, food vendor and consumer. Other actors in their respective channel were as follow: Channel I includes, farmer and consumer, channel II includes farmer, food vendor

and consumer and the participants in channel III were farmers, retailers, food vendors and consumers. Other actors in Irish potatoes marketing channel were farmers, village assemblers, retailer and consumer in channel IV, farmers, village assemblers, retailer, food vendor and consumer in channel V and in channel VI were farmers, village assemblers and wholesalers.

The findings on marketing margin revealed that producer' share and marketing margin maintained by various chain actors varied across the different marketing channels. The analysis shows that the total gross marketing margin (TGMM) in Irish potatoes trading was highest in channel V and the lowest total gross marketing margin was in channel VI. On the side of actors margin in different channel food vendor had the highest marketing margin in channel II and village assemblers was found to have the lowest marketing margin in channel V. The highest net marketing margin in Irish potatoes marketing chain was observed in channel IV by the retailers' group and the lowest net marketing margin was attained by village assemblers category in channel V. The highest net marketing margin in channel IV was made by retailers due to exclusion of food vendors participation in the market channel. Village assemblers attained the lowest net marketing margin in channel V due to the inclusion of food vendor participation in the market channel.

5.2 Recommendations

The present study identified different challenges in Irish potatoes production and marketing in Mbulu and Babati districts. The findings show several factors contribute to low yield of Irish potatoes production per hectare in the study area. Therefore, the following recommendations are suggested to farmers, policy makers (government) and researchers for

the improvement of Irish potatoes production and well marketing performance of Irish potatoes in the study area.

(i) To Irish potatoes growers

Firstly Farmers are recommended to use modern farming equipment/tools which are within their ability. Most of the factors affecting production of Irish potatoes in the study area were out of the farmers' capability. However the use of inorganic fertilizer is within farmers' control. Therefore farmers are advised to apply fertilizer during farming in order to improve their production and to remove their misconception that inorganic fertilizers reduce soil fertility.

Secondly, it is recommended that farmers in Mbulu and Babati districts should use improved seed variety which has high yield than the local variety. Since Rongai and Farm varieties are regarded as the improved seed and have high yield than the local (Iraqw) therefore, it is recommended farmers to use these varieties.

Thirdly farmers should form stronger organizations/associations for Irish potatoes growers in the study area so as to be able to facilitate marketing process as well as proper technology transfer and effective capacity building. Through associations farmers can be able to mobilize saving and credit facilities which can provide funds for urgent need while speculating for higher prices when there is low supply of potatoes in the market. Farmers association also help in increasing bargaining power during marketing of Irish potatoes.

Fourthly, it is also recommended that farmers in the study area should increase the scale of production in order to enjoy the benefits of Irish potatoes.

(ii) To Irish potatoes traders

The potato market does not have its own board, but one should be established. All marketing activities could be organised better if there was a potato board. The board could be responsible for the potato trade information centre, which collects all of the data for foreign trade, and publish and distribute analysed data into the business community. Furthermore, it could help in creating legal, registered potato exporting companies, which is important since farmers sell most of their crop. Collective marketing would be one of the core tasks of the board. The board could also help to make farmers creditworthy, and the SACCOs and the banks could therefore give loans to farmers more comfortably. If the potato board were to be established, it would make the need for farmers' groups less significant, as there would be an organisation enhancing farmers' bargaining power.

(iii) To policy makers (government)

Firstly it is recommended that the government or the public sector should formulate a strategy involving the private sector for improving the access to disease free seed potato at affordable prices during the planting season. Therefore, government should strengthen and encourage research institution like SUA to conduct a research on the disease like bacteria wilt which has no chemical control in order to get the solution of the problem.

Secondly, the agricultural extension services should be employed in the area and empowered so that they can train farmers about the best crop management practice and cropping patterns. This can help farmers to follow the crop management practices like the use of fertilizer, improved seeds and to get correct treatment for disease attacking their product and to have judicious use of available resources.

Thirdly, cost of inputs like pesticide in Irish potato production is a major share of total production cost. Therefore, government and agro-dealer should try to introduce cost minimizing strategy for pesticide and other inputs in order to help the farmer to reduce cost of production. It is also suggested that farmers, agricultural scientists and policy makers should put emphasis on increasing Irish potato yield rather than increasing price support for Irish potato.

Fourthly, by considering geographical location of the area which is mountainous, government should pay attention on developing and improving physical infrastructure like road in order to make smooth transportation of the crop from the farm to the market. As for infrastructure concerns, the road network is seen as the most crucial. Therefore, the government should invest in the road network to a greater extent. Also small feeder roads should be build and maintained.Improvement of infrastructure particularly road will help in minimizing transportation cost hence traders can buy farmers product in reasonable price.

Fifthly, there is an urgent need of encouraging farmers on formation of groups or cooperative which will be work on marketing of Irish potatoes. This can help farmers to have a power in bargaining price of Irish potato and to get the loan easily from financial institution. In addition to that agricultural administrators and policy- makers must think of a permanent and sustainable provision of up to date and timely information about inputs, input prices and output market prices in order to promote Irish potato production in the study area.

Sixthly, it is recommended that scientists and policy makers should introduce modern Irish potato varieties in the study area so as to increase production in the area. They should

introduce the varieties that give high yield at par with top level Irish potatoes growing region in the country, because seed is the key player in getting higher crop yield.

Lastly, it is further recommended that, government should introduce the policy on Irish potato market channels which will reduce the multiple handling of Irish potato from the farmer to the consumer. This can be done by breaking down the domination of middlemen and brokers along the market channel that lead farmer's exploitation. Policy makers should pay much attention on improvement of marketing channels and on-farm storage facilities so that farmers would be able to store their product when there is the bulk of the product in the market. Poor marketing channel and absence of on –farm storage facilities are among of the factors that cause the great margin between the wholesale and cooking vendor prices in the urban area.

5.3 Area for Further Research

This study recommends that further research on post-harvest management of Irish potatoes should be undertaken by different researchers, in order to identify the methods used by traders to store their product before marketing.

REFERENCES

Ali, A. M., Leeuwen, H. M. and. Koopmans, R. K. (2001). Benefits of draining agricultural lands in Egypt. Results of five years' monitoring drainage effects and impacts. *Journal of Water Resource Development* 17(4): 633 – 635.

Aqwu, A. E., Ekwueme, J. N. and Anyanwu, A. C. (2008). Adoption of improved agricultural technology disseminated via radio farmer program by farmers in Enugu State. *International Journal of Agriculture and Crop Sciences* 6: 112 – 136.

Akintomide, M. J. and Antai, S. P. (2012). Protein enrichment of Irish Potato (*Solanium tuberosium*) Peel through solid substrate fermentation. *Journal of Environmental Science, Toxicology and Food Technology* 1: 1 – 10.

Anderson, J. N. (1996). Potato cultivation in the Uporoto Mountains, Tanzania. Analysis of social nature of agro-technological change. *African Journal of Social Affairs* 95: 85 – 106.

Anderson, P. K. (2008). *A Global Perspective of Potato Production in Emerging Market.* International Potato Centre, Dundee, Scotland. 238pp.

Bailey, K. (1994). *Methods of Social Research.* (4th Edition). A Division of Macmillan Inc., New York. 588pp.

Bank of Tanzania (2010). *Economic Review in Tanzania Annual Report.* Government Printer, Dar es Salaam Tanzania. 5pp.

Bekele, A., Belay, K., Legesse, B. and Lemma, T. (2011). Effects of crop commercial orientation on production on productivity of smallholder farmers in drought-prone areas of the central Rift Valley of Ethiopia. *Journal of Rural Development* 33(4): 101 – 120.

Blanken, J. (1994). The triple role of potatoes as a source of cash, food and employment. Effects on nutritional improvement in Rwanda. *Journal of Development and Agricultural Economics* 1(6): 32 – 56.

Blanken, J., Braun, J. and Haen, H. (1994). *Agricultural Commercialization, Economic Development and Nutrition.* Johns Hopkins University Press, London. 294pp.

Carter, M. R. (1984). Identification of the inverse relationship between farm size and productivity. An empirical analysis of peasant agricultural production. *Oxford Economics Journal* 36(1): 120 – 135.

Cohen, J., Cohen, P., West, S. G. and Aiken, L. S. (2003). *Applied Multiple Regression Correlation Analysis for The Behavioural Sciences.*(3rd Ed.), N.J: Lawrence Erlbaum Associates, Mahwah. 150 pp.

Craig, C. and Gordon, A. (2001). *Rural Non-Farm Activities and Poverty Alleviation in Sub Saharan Africa.* Natural Resource Institute, Green 112pp.

Cramer, G. L. and Jensen, W. (1982). *Agricultural Economics and Agribusiness*. (2nd Edition), McGraw Hill Book Company, USA. 267pp.

Dastagiri, M. B., Kumar, B. G., Hanumanthalah, C. V., Paramasivsm, P., Sidhu, R. S., Sudha, M., Chand, K., Singh, B. and Mandal, S. (2010). *Estimations of Marketing Efficiency of Horticultural Commodities under Different Supply chain in India.* National Centre for Agricultural Economics and Policy Research, New Delhi, India. 516pp.

Demo, P., Dominguez, C., Cumbi, S. and Walker, T. (2005). The potato to sub-sector and strategies for sustainable seed production in Mozambique. [http://www.acad emicjournals.org/JDAE] site visited on 22/7/2012.

Demo, P., Connell, T. And Khumar, N. (2009). Potential of potato farming in improving the livelihoods of small scale farmers in Malawi. *African Crop Science* 9: 761 – 765.

Deshmukh, P. R., Kadam, R. P. and Shinde, V. M. (2007). Knowledge and adoption of agricultural technologies in Maradhawa. *Extension Education* 7(1): 41 – 43.

DucHai, L. T. (2003). The organization of the liberalized rice market in Vietnam. Thesis for Award of PhD Degree at University of Groningen, Groningen, Netherlands, 236pp.

Due, J. M. and Gladwin, C. (1991). Impact of structural adjustment programs on African women farmers and female headed households. *American Journal of Agriculture Economics* 2: 1431 – 1439.

Duze, M. and Mohamed, Z. I. (2006). Male knowledge, attitudes and family planning practices in Northern Nigeria. *African Journal of Reproductive Health* 10(3): 53 – 65.

Ellis, F. (1988). *Peasant Economic Farm Households and Agrarian Development*. Cambridge University Press, United Kingdom. 201pp.

Eze, C. C., Imbikwe, U. C., Onoh, P. O. and Njwajiuba, C. U. (2006). Determinants of adoption of improved of improved cassava production technologies among farmers in Enugu State of Nigeria. *Global Approaches to Extension Practice* 2(1): 37 – 44.

FAO (1993). World Food [http:// faostat.fao.org] site visited on 16/10/2012.

FAO (2004). Statistics food and agriculture organization, Rome, Italy. [http:www.apps.fao.org] site visited on 10/5/2013.

FAO (2007). On line statistical data base of the Food and Agricultural Organization the United Nations. [http:// faostat.fao.org] site visited on 16/05/2012.

FAO (2008). Potato world production and consumption. [http://faostat.fao. org/default.aspx] site visited on 1/5/2013.

FAO (2009). International year of the potato. [http://faostat.fao.org/default.aspx] site visited on 10/12/2013.

Feldman, D. And Shine-Yankyaran, K. (1984). Food commodity prices macroeconomic policies and constraints on marketing structure. *Journal of Sustainable Development in Africa* 2(3): 283 – 300.

Ferris, A. and Malcolm, B. (2000). *Farm Management Economic Analysis*. Victoria University, Melbourne. 224pp.

Ferris, R. S., Okoboi, G., Crissman, C. and Lemaga, B. (2003). Performance and growth prospect of Irish potatoes as component for development of strategic export in Uganda. *Journal of Development and Agricultural Economics* 1(2): 76 – 95.

Gebregziabeher, D. (2010). Marketing chain analysis of poultry: The case of Alamata and Atsbi-Wonberta Woredas of Tigray region. A Dissertation for Award of MSc Degree at Haramaya University, Ethiopia, 146pp.

Giles, G. B. (1973). *Marketing the English Language Book Society and Macdonald*. Evans Ltd., London. 127pp.

Gildemacher, P. R., Demo, P., Barker, I. and Kaguongo, W. (2009). A description of seed potato system in Kenya, Uganda and Ethiopia. *America Journal of Potato Research* 54(5): 373 – 382.

Godden, B. (2004). Formula for determine sample [http://www.williamgodden.com/sample/sizeformulas.pdf.] Site visited on 09/08/2012

Goossens, F. (2002). *Potato Marketing in Rwanda. Agricultural Policy Development Project.* Research Report No. 12. Abt. Associates Inc.,Rwanda. 102pp.

Hakiza, J. J., Turyamureeba, G., Kakuhenzire, R. M., Odondo, B., Mwanga, R. R., Kanzikwera, R. and Adipala, E. (2000). Potato and sweet potato improvement in Uganda: A historical perspective. *African Crop Science Journal* 5: 47 – 58.

Gujurati, D. N. (1995). *Basic Econometrics,* fifth edition. Mc Graw- Hill.Inc. International Editotion. New Delhi. 705pp.

Hoffler, H. and Ochieng, B. O. (2008). High commodity prices – who gets the money? Preliminary findings for world food day potato. [http://www.cipotato.org/ pressroom/facts/figures/_international_year_of_the_potato.asp] site visited on 15/5/2013.

Jakobson, H. and Malley, M. (1976). Potato production in Tanzania. *Regional Workshop on Potato Seed Production and Marketing*, Nairobi, Kenya.177pp.

Junge, B., Deji, O., Abaidoo, R., Chikoye, D. and Stahr, K. (2009). Farmers' adoption of soil conservation technologies: A Case Study from Osun State, Nigeria. *Journal of Agricultural Education and Extension,* 15(3): 257 – 274.

Kaaria, S., Sanginga, P., Njuki, J., Delve, R., Chitsike, C. and Best, R. (2007). Enabling rural innovation in Africa: An approach for empowering smallholder farmers to access market opportunities for improved Livelihoods.[http://www.future-agricult ures.org/farmerfirst] site visited on 12/06/2013.

Kabungo, C. V. D. (2008). Evaluation of Irish potato production and marketing performance: A case study of Mbeya Rural District, Mbeya Region, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 102pp.

Kaguongo, W. P., Gildemacher, P., Demo, P., Wagoire, W., Kinyae, P., Andrade, J. Forbes, G., Fuglie, K. and Thiele, G. (2008). *Framer Practice and Adoption of Improved Potato Varieties in Kenya and Uganda.* Sciences Working Paper No. 5. International Potato Center, Lima, Peru. 85pp.

Kelly, T. (2006). Tanzania Potato production. [http://research.cip.cgiar.org/ confluence/display/wpa/Tanzania] site visited on 15/02/2014.

Kiiya, W. W., Mureithi, J. G. and Kiama, J. M. (2006). Improving production of Irish potato (*Solanum tuberosum*) in Kenya: The use of green manure legumes for soil fertility improvement: Development and up scaling of green manure legumes technologies in Kenya. *Journal on Sustainable Agriculture Research* 1(1): 130 – 146.

Kinyua, Z. M, Smith, J. J, Odour, G. I. and Wachira, J. N. (1998). Increasing the Availability of Disease-Free Potato Seed Tubers to Holder Farmers in Kenya. The triennial congress of the international symposium for tropical root crops African Branch. *International Center for Research on Agro Forestry* 3: 494 – 498.

Kirumba, W., Kinyae, P. And Muchara, M. (2004). Irish potato market. Survey promotion of private sector development. *African Journal of Agricultural Research* 7(12): 94 – 99.

Koizumi, M. (2007). Comparative study of farming systems in South-Western Tanzania: Agrarian adaptation in a socio-historical perspective. *African Study on Monogram* 34: 3 – 20.

Lamin, K. M., Fatty, L. and Sambou, D. (2013).Irish potato production in the West Coast Region of the Gambia. *Journal of Agriculture Science Developments* 2(4): 8 – 16.

Lemaga, B. (1997). Integrated control of potato bacterial wilt. Literature Review and work plan 1995-1997. The African highlands Initiative Technical report Nairobi. *International Center for Research on Agro Forestry* 3: 67 – 72.

Luh, Y. (1995). Are farmers learning by doing? Experience in Taiwan. *Review Agricultural Economics* 17(2): 213 – 227.

Lupilya, G. S. (2007). Assessment of social support projects for vulnerable groups towards Poverty reduction: A case study of TASAF in Bukoba district. Dissertation for Award of MA Rural Development at Sokoine University of Agriculture, Morogoro, Tanzania, 112 pp.

Lyatuu, G. (1994). The role of credit in the adoption of improved agriculture technology by small scale farmers: A case study of maize growers in southern highland of Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 112pp.

Macha, C. A. (1982). *Report on Participants on Potato Production in Tanzania. International Potato Production, Storage and Seed Technology.* Wageningen Press, Wageningen. 25pp.

Mafuru, J. M. (2007). Ex-ante adoption analysis for improved sorghum varieties in the Lake Zone Tanzania. *African Crop Science* 8: 1215 – 1219.

Maganga, A. M. (2012). Technical efficiency and its determinants in Irish Potato production: Evidence from Dedza District Central Malawi. *African Journal of Agricultural Research* 7(12): 794 – 799.

Maganga, A. M., Edriss, A. K. and Matchaya, C. G. (2012).Un exploited profit among smallholder farmers in Central Malawi. What are the sources? *International Journal of Applied Economics* 9(2): 83 – 97.

Maingi, D. M., Nganga, N. and Kidanemariam, H. M. (1992). Collection and evaluation of farmers' informally released potato varieties in Kenya. In: *Proceedings of International Potato Centre Technical Workshop on Collaborative Research*, Nairobi, Kenya. pp. 27 – 31.

Manage, E. (2007). Regression analysis. [http://www.12manage.com/method/ regression/analysi sutml] site visited on 19/1/2013.

Mayona, C. M. (1995). Potato production in the Southern Highlands of Tanzania potential and constrains. A case study of Mbeya Rural District, Mbeya Region, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania,130pp.

Mc Neill, W. H. (1999). How the potato changed the world's history. *Social Research* 66(1): 67 – 83.

Mendoza, G. (1995). *A Primer on Marketing Channels and Margins. Prices, Products and People: Analyzing Agricultural Markets in Developing Countries.* Lynne Reinner Publishers, London, United Kingdom. 498pp.

MOA (2005). *National Policy on Potato Industry. Policy and Reforms in the industry to improve Production.* Research Marketing and Regulatory Framework, 55pp.

Ministry of Agriculture and Cooperatives (2001). *Basic Data Annual Report*. Dar es Salaam, Tanzania. 115pp.

Monlruzzaman, M. S., Rahman, M. K., Karim, A. and Alam, Q. M. (2009). Agro-economic analysis of maize production in Bangladesh: A farm level study. *Bangladesh Journal of Agriculture Research* 34(1): 15 – 24.

Mpogole, H., Mlambit, M. E. and Kadigi, R. M. (2012). Round potato *(Solanum tuberosum*) Production in Southern Highlands of Tanzania. *Journal of Agricultural Extension and Rural Development,* 4(14): 185 – 191.

Mugisha, J. L., Katungi, E. L. and Katwijukye, A. K. (2010). *Enhancing Potato Production and Market Access in Uganda. Research Application Summary.* Department of Agricultural Economics and Agribusiness, Makerere University, Entebbe, Uganda. 67pp.

Mureithi, L. M. M. (2000). Farmer's participation in management of potato bacterial wilt in Kenya. *African Potato Association* 5: 361 – 367.

Mussei, A. N. (2000). Adoption of improved technologies and the contribution to the farms' income. Njombe District Uyole Mbeya. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 125pp.

Muthoni, J. and Nyamongo, D. O. (2009). A review of constraints to ware Irish potatoes production in Kenya. *Journal of Horticulture and Forestry.*1 (7): 3 – 5.

Mwakaje, A. G. (2010). Information and communication technology for rural farmers. *Journal of Information Technology Impact* 10(2): 111 – 128.

Mwakasendo, J. A. (2007). Market for fresh and frozen potato chips in the ASARECA Region and the potential for regional trade. *Journal of Agriculture science* 2: 15 – 30.

Mwangi, S. C., Oliver, L. E., Mbatia, J. and Nzuma, M. (2013). Effects of marketing reforms on Irish potato price volatility in Nyandaru District Kenya. *Journal of Economics and Sustainable Development* 6: 11 – 24.

Mwanukuzi, P. K. (2010). Impact of non-livelihood-based land management on land resources: The case of upland watersheds in Uporoto Mountains, Western Tanzania. *The Geographical Journal* 177(1): 27 – 34.

Namwata, B. M. L. (2010).Adoption of improved agricultural technologies for Irish potatoes (*Solanum tuberosum*) among farmers in Mbeya Rural district, Tanzania; A Case of Ilungu ward. *Journal of Animal and Plant Sciences* 8(1): 927 – 935.

National Bureau of Statistics (2012). *Population and Housing Census Report*. Government Printers, Dar es Salaam, Tanzania.264pp.

Nganga, N. M., Kinyae, P., Walingo, A. and Wakahiu, M. (2003). *Establishing Effective Seed Potato Prices for Small Scale Farmers in Kenya.* Nairobi, Kenya. 35pp.

Nyangeri, J. B., Gathuru, E. M. And Mukunya, D. M. (1984).Effect of latent in fection and the spread of bacterial wilt of potatoes in Kenya. *Tropical Pest Management* 30: 103 – 105.

Nyikai, R. A. (2003). Commercial and subsistence farming. What is the future for smallholder Kenyan agriculture? *African Journal for Crop Science* 6: 591 – 596.

Nyunza, G. and Mwakaje, A. E. (2012). Analysis of round potato marketing in Tanzania: The case of Rungwe District, Tanzania. *International Journal of Business and Social Science* 3(23): 8 – 15.

Odoemenen, I. U. and Obinne, C. P. (2010). Assessing the factors influencing the utilization of improved cereal crop production technologies by small-scale farmers in Nigeria. Indian. *Journal of Science and Technology* 3(1): 180 – 183.

Okoboi, G. (2001). *The Marketing Potential of Potatoes in Uganda and Market Opportunities for Rwanda.* International Institute of Tropical Agriculture, Kampala, Uganda. 61pp.

Okoedo-Okojie, D. U. and Onemolease, E. A. (2009). Factors affecting the adoption of yam storage technologies in the Northern ecological zone of Edo State, Nigeria. *Journal of Human Ecology* 27(2): 155 – 160.

Omoregbee, F. and Okoedo-Okojie, D. U. (2008) .Farmers' characteristics and adoption of recommended practices under the Fadama Project Scheme in Edo State, Nigeria. *Global Journal of Agricultural Sciences* 7(1): 45 – 48.

Otipa, M. J.,Wakahiu, M. W., Kinyae, P. M., Thuo, D. M. and Kinoti, J. I. (2003). *Survey of the Bacterial Wilt of Potatoes Caused by Ralstonia solanacearum and its Spread in Major Potato Growing Areas of Kenya.* Task force Report to the Director. Kenya Agricultural Research Institute. Nairobi, Kenya. 18pp.

Pingali, P. Khwaja, Y. and Meijer, M. (2005). *Commercializing Small Farms: Reducing Transaction Costs.* In: The future of small farms. Overseas Development Institute, Wye, UK. 79pp.

Quaye, W. and Kanda,I. J. (2004). Bambara marketing margins analysis. Food Research Institute. [http://www.ajbrui.net] site visited on 26/1/2014.

Quisumbing, A.R. (1996). Gender differences in agricultural productivity: methodological Issues and Empirical Evidence. *Global Journal of Agricultural Science* 7: 45 – 48.

Rahhi, A. Y. (2011). Determination of profitable crop production options for Bashay irrigation schemes in Mbulu District. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 129pp.

Rahko, J. (2011). Potato value chain in Tanzania. dissertation for Award of MSc Degree at University of Helsinki, 31pp.

Rudra, A. (1983). Non-maximising behaviour of farmers: Crop selection. *Journal of Economic Policy* 18(40): 1717 – 1722.

Saka, J. O., Okoruwa, V. O., Lawa, I. B. O. and Ajijola, S. (2005). Adoption of improved rice varieties among small-holder farmers in South-Western Nigeria. *World Journal of Agricultural Sciences* 1 (1): 42 – 49.

Salasya, B., Mwang, W., Mwabu, D. and Diallo, A. (2007). Factors influencing adoption of stress tolerant maize hybrid (WH 502) in Western Kenya. *African Journal of Agricultural Research* 2(10): 544 – 551.

Schumacher, E. F. (1989). *Small is Beautiful*: *Economics as if People Mattered.* Harper Perennial, London. 169pp.

Saunders, M., Lewis, P. and Thorn hill, A. (2004). R*esearch Methods for Business Students*. (2nd Edition), Prentice Hall, New York. 138pp.

Scott, G. J., Rosegrant, M. W. And Ringler, C. (2000). *Roots and Tubers for the 21st Century: Trends, Projections, and Policy Options. Food, Agriculture, and the Environment.* Discussion Paper No. 31. International Food Policy Research Institute, Nairobi, Kenya. 18pp.

Senkondo, E. (1988). Economic analysis of Sugar Industry. Dissertation for Award of MSc Degree at Sokoine University of Agriculture Morogoro, Tanzania, 158pp.

Smith, M. K. and Stockbridge, M. (1999). Case study of corruption agricultural markets in Sindh Province. Pakistan and Implications for Market Liberation. *Journal of International Food and Agribusiness Marketing* 1: 19 – 53.

Sokoni, C. H. (2001). *The Influence of Agricultural Market Reforms on Highlands Farming System In Tanzania.* The case study of Uporoto Highlands, Mbeya Region.Dar es Salaam University Press, Dar es Salaam, Tanzania. 147pp.

Sokoni, C. H. (2008). Commercialisation of smallholder production in Tanzania: Implications to sustainable resource management. *Geographical Journal* 174(2): 158 – 161.

Smith, L. E. D., Khushk, A. M. and Stockbridge, M. (1999). Case studies of corruption in agricultural markets in Sindt Province, Pakistan and Implications for Market Liberation. *Journal o International Food and Agribusiness Marketing* 11(1): 19 – 41.

Strasberg, P. J., Jayne, T. S., Yamano, T., Nyoro, J., Karanja, D. and Strauss, J. (1999). *Effects of Agricultural Commercialisation on Food Crop Input Use and Productivity in Kenya*. Office of Sustainable Development, Nairobi, Kenya. 41pp.

Takele, A. (2010). Analysis of rice profitability and marketing chain: The case of Fogera Woreda, South Gondar Zone, Amhara National Regional State, Ethiopia. Dissertation for Award of MSc Degree at Haramaya University, Ethiopia, 133pp.

Tanya, B. (1999). *Household Food Economy Assessment Arusha Region Consultant.* The Food Economy Group, Arusha, Tanzania. 102pp.

Temu, A. E. and. Temu, A. A. (2005). High value agricultural products for smallholder markets in Sub-Saharan Africa: Trends, opportunities and research priorities. *International Workshop on How Can The Poor Benefits From The Growing Markets For High Value Agricultural Products International Center for Tropical Agriculture,* 3 – 5 October 2005, Cali, Colombia. 253pp.

THBS (2012). *Tanzania Household Budget Survey Report*. National Bureau of Statistics, Dar es Salaam, Tanzania. 89pp.

Tomek, W. G. and Robson, K. L. (1990). *Agricultural Product Prices*. (3rd Edition). Camel University Press, Cornell. 108pp

URT (2012). *Babati District Socio-Economic Profile.* District Executive Director, Babati, Tanzania 122pp.

URT (2012). *Mbulu District Socio-Economic Profile*. District Executive Director, Manyara, Tanzania. 112pp.

URT (2012). *National Sample Census of Agriculture Smallholders Agriculture*. Government Printers, Dar es Salaam, Tanzania. 77pp.

Wilhemina, Q. and Kanda, I. J. (2004). *Bambara Marketing Margins Analysis*. Food Research Institute, Accra, Ghana. 38pp.

Wolter, D. (2008). Tanzania why a potential food exporter is still importing food. Development Centre, Paris. [www.oecd.org] site visited on 18/07/2013.

World Bank (2002). Implementing the new rural development strategy in a country driven process: Agriculture and rural development project profiles. *Presentation at the Country Director Rural Sector Board Learning Event,* 8 – 10 September 2002, Antalya, Turkey.98-101pp.

World Bank (2009). *Gender in Agriculture Source book*. The International Bank for Reconstruction and Development, Washington DC. 22pp.

WPC (2013). *Guide to Commercial Potato Production Potato Marketing and Cost of Production.* Earth scan, UK. 94pp.

Yohannes, M., John, G. and Garth, C. (1993). *Strategic Decision-Making: Adoption of Agricultural Technologies and Risk in Peasant Economy.* Cornell University Press, Cornell. 234pp.

APPENDICES

Appendix 1: Producer survey questionnaire

Section A. Household information

1.0. Name of respondent.....

2.0. Region ……..2.1 District ……

2.3 Division..... 2.2 Ward …….....

2.3 Village …….…….....…….....…….....

3. Sex of respondent 0= Male 1= Female

4. Age of respondent.....

5. Marital status of respondent …….. 1=Married 2=Single 3=Divorced 5=Widowed

6. Education level of the respondent.....

1=No formal education 2=Primary education 3=Secondary education

4=Tertiary education

7. Number of household members by age: 1=1-18yrs 2=19-35yrs 3=36-60yrs 4=60 and above

8. What is your main occupation?

1= Farmer, 2= employed, 3= casual labor,

4=Business (specified), 5= others (specified)…….

9. What is your major source of income in your family? : 1= Sales of food crop, 2= Sales of cash crop, 3= sales of livestock and its products, 4= wage employment, 5= off- farm income generating activities, 6= others (specify)……

Section B. Information on Irish potato production

10. How many acres of land do you own?..... …….....

11. How much of that land do you use for crop production?..... ……..

12 How many acres used but not owned (rented)?.....

13. On average how many acres of land do you use for Irish potato farming?.....

14. How many acres were cultivated in 2011/2012 for Irish potato farming?

15. How many seasons in a year do you farm potatoes?

16. What is the main source of labour used in Irish potato production?
    1=Family, 2=Hired 3=Family and hired
17. If hired what is the daily wage rate?
18. What type of technology do you use in the farm?
    1=Hand hoe, 2=Animal traction 3=Tractor
19. How many bags/kg per acre did you harvest during the last harvest?
20. What types of seeds do you use?
    1=improved, 2=Local seeds
21. Do you use fertilizer? 0=yes 1=No
22. If yes what type of fertilizer do you use?1=Urea, 2=CAN, 3=DAP, 4=TSP,5=Others (specify)……
23. If not using fertilizer why? 1=Not available, 2=Expensive, 3=Not required, 4=others (specify)……
24. Do you use pesticide to control disease? 0=yes, 1= No
25. If not why? 1=Not available, 2=Expensive, 3=Not aware, 4= No serious disease,5= others (specify)……
26. Indicate cost for different operations in Irish potato production

Number	Operation	Costs/Tsh
1	Hiring land	
2	Land cultivation	
3	Harrowing	
4	Planting	
5	Pesticides	
6	Fertilizer	
7	Weeding	
8	Labour	
9	Seed cost	
10	Harvesting cost	

27. Give information about Irish potato yield in 2011/2012

Area planted	Production per/acre	Total production	Quality sold	Price per kg	Total earning

28. Have you attended any seminar/training on potato farming in the last 6 months 1=Yes2= No
29. What major operational and marketing challenges do you encounter in potato production?
30. Is access to market problem? 0=Yes, 1= No
31. When do you sell Irish potato? 0= Before harvest, 1=After harvest
32. Where do you sell your produce.....
33. Who are the major customers of your produce?
    1=Individual, 2=Wholesaler, 3=Trucker, 4=Others
    (specify)……
34. How do you always get those customers.....
35. What is the means of transport?.....
36. What is the cost of transporting one bag of Irish potato from the farm to the market?.....
37. Do you have a problem in getting market information? 0=Yes, 1=No
38. If no where do you get market information? 1=traders, 2=neighbours, 3=friends and relative 4=Radio, internet, 5=magazines,
    others (specify).....
39. What type of information do you get? 1=Price of the produce, 2=Price of inputs, 3=Quality and standard of produce, 4=others
    (specify)…….
40. What marketing and market access challenges do you encounter?
    1…….
    2……
41. What are your sources of finance (tick where appropriate)
    1. Personal savings
    2. Bank/MFI loans
    3. Loans from friends and relatives

4. Loan from SACCOS
5. Loan from membership groups
6. Others (specify).....

42. What financial challenges do you encounter while running in production?.....
43. How easy is it to access finance? (Please tick one number)
    1=Very easy, 2= Easy 3= Difficult, 4= Very difficult
44. Do you belong to any association/SACCOS/group? 0= Yes, 1= No
45. If yes specify group……
46. How do you benefit from that association?
    1…….
    2……
47. What assistance financial operational and marketing would you need to increase production and productivity
48. Do you have access to extension service? 0=Yes 1=No
49. If yes where do you get extension services? 1= village extension officer, 2=NGOs, 3=Research, 4= Others (specify)
50. What kind of services do you get?
    1=……..2=……..3=……4=……..
51. Are there benefits from the services provided? 0=Yes,1=No
52. If yes what benefits
    1=…….2=……..3=……4=……

Appendix 2: Traders (Wholesalers/Retailers) Survey) questionnaire

Section A. Household information

1.0. Name of respondent.....

2.0 Region ……2.1 District ……..

2.3 Division.....2.2.Ward ……

2.3 Village ……

3. Sex of respondent 1= Male 2= Female

4. Age of respondent.....

5. Marital status of respondent ……..

1=Married 2=Single 3=Divorced 5=Widowed

6. Education level of the respondent.....

1=No formal education 2=Primary education 3=Secondary education

4=Tertiary education

7. Type of trade involved……

1= Wholesaler 2= Retailer

Section B. Information on Irish Potato Marketing

8. What was your initial capital (in TZS)…… Source……

9. Who are your sources of the Irish potato?

( ) =Farmers ( )= Local assembler ( ) = Local processors ( ) = Transporters (…..)=Wholesalers ( )= Other (specify) ……

10. At what average price do you buy Irish potato? TZS…….. /kg/bag/tone. (Select the appropriate units).

11. Who sets price for Irish potato? 1= Buyer 2= Seller 3= Both 4= Other (Specify).....

12. What factors are considered in setting the buying price for Irish potato

☐ = Moisture content ☐ = Size ☐ = Weight ☐ = Supply forces

☐ = Demand forces

☐ = Quantity/grades ☐Other (Specify)……..

13. What was the mode of the trade? 1= Contract sale 2= First come/first served 3= Others (Specify)……

14. What was the mode of payment? 1= Cash 2= Credit 3= Other (Specify)……...

15. In what form do you buy Irish potato? 1= Raw 2= Processed 3= Others (Specify)…….

16. After purchase, what kind of activities do you do before selling crop product?

Activities	**Tick where appropriate**	**Cost associated per kg/bag/tone. (Select the appropriate units).**	**New price after the activities**
Preservation/handling			
Storage			
Transport			
Processing			
Other (specify)			

17. If storage, what are some storage techniques you are engaged in

……

……

18. If transportation, what mode of transport do you use?

1= By head 2= Bicycle 4= Public transport 5= Truck/ pick- up 6= Other (specify)

……

19. Is the transport mode own or hired?

1= Own 2= Hired

20. Do you share this mode of transport with others?

1= Yes 2= No

21. If yes, how do you share the costs?

1= By weight/ volume 2= Per trip 3= Equally 4= Per distance 5= Other (Specify)…….

22. How is the transport cost determined?

1= Per weight/volume2= Per distance 3= Per trip 4= Other (specify)……

23. Where/to whom do you sell your product?

☐ = Wholesaler☐ = Retailers

☐ = Consumers

☐ = Other (Specify)…….

24. At what price do you sell your products? TZS……. /kg/bag/tone. (Circle the appropriate unit).
25. What quantity did you sell last year?…….bags…….kgs. (Select the appropriate units)
26. What criteria do you use in determining the selling price?

☐ = Moisture content ☐ Size of cassava ☐ = Weight ☐ = Supply forces

☐ = Demand forces ☐ = Quantity ☐ = Grades ☐ = Other (Specify)……

27. Do you buy production behalf of others?

1= Yes 2= No

28. If yes, how much commission do you get? TZS……..…./Kg/ bag/ tone (Select the appropriate units)
29. Are you a member of any association/cooperatives? 1= Yes 2= No
30. If yes, what benefits do you get by being a member of the association or any other organization?
31. Is there any credit institution in your village? 1= Yes 2= No
32. If yes, list them and briefly explain how they support you?

1=……..... 2= ……3=……..

4=……5=……6=……

33. What is your opinion on the quality of Irish potato that you buy?

1=……

2=……

34. Please list major business constraints faced in Irish potatoes marketing

Appendix 3: Food vendors survey questionnaire

Section A. Household Information

1. Name of respondent.....

2.0 Region…….....2.1 District ……...……

2.3 Division..... 2.2 Ward …….....

2.3 Village. …….

3. Sex of respondent 1= Male 2= Female

4. Age of respondent.....

5. Marital status of respondent …….. 1=Married 2=Single 3=Divorced 5=Widowed

6. Education level of the respondent.....

1=No formal education 2=Primary education 3=Secondary education

4=Tertiary education

Section B. Information on Irish Potato Food vendor

7. Do you process the product? 1=yes 2=No

8. If yes what potato products do you make e.g.1= crisps, 2= chips,3= flour,4= wine, Others (specify).....

9. What is the value of finished product compared to unprocessed potatoes?

Product	Cost of 1kg Tsh	Processed cost	Price of final product	Gross margin

11. Is there a ready market for the product? 1= Yes 2= No

12. What major operational challenges do you encounter in running the business?

1……...

2……

13. What are your sources of finance (tick where appropriate)

a. Personal savings

b. Bank/MFI loans

c. Loans from friends and relatives

d. Loan from SACCOS

e. Loan from membership groups

f. Others (specify).....

14. Who are your sources of Irish potato

☐ = Farmers ☐ = other processors ☐ = Wholesalers ☐ = Retailer

☐ = Other (specify)…….

15. At what average price do you buy Irish potato? TZS……..1= /kg, 2=bag,3=tone. (Circle the appropriate unit)

15. Who sets price for Irish potato product ? 1= Buyer 2= Seller 3=Both 4= Other (Specify).....

16. What factors are considered in setting the buying price for Irish potato?

☐ = Moisture content ☐= Size ☐ = Weight ☐ = Supply forces

☐ = Demand forces ☐= Quantity ☐ = Other

(Specify)……..

17. What other costs did you incur in buying Irish potato? (Estimate cost in Tsh per category)

1= Transport…….…….. 2= Storage…….

3= Preservation…….. 4= Other (Specify)……

18. What are some storage techniques you are engaged in