ECONOMIC ANALYSIS OF IRISH POTATO VALUE CHAIN IN NJOMBE URBAN AND WANGING'OMBE DISTRICTS, TANZANIA

BEATRICE DANIEL

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

2015

ABSTRACT

This study analyzed Irish potato value chains so as to identify potential areas for interventions towards improving income for the various actors involved in the chain in Njombe Urban and Wanging'ombe districts. Data were collected from 202 Irish potato value chains actors using individual interview and focused group discussions (FGD). Sub sector mapping, gross margin analysis and regression analysis were used in the study. Sub-sector mapping analysis was used to map Irish potato value chains in Njombe urban and Wanging'ombe districts. Gross margin along all Irish potato actors involved in the chain were computed. Results indicate variations in gross margins with the highest gross margin of Tshs. 2939 per kg obtained by local processors while the traders were receiving the average gross margin of Tshs. 421 per kg, farmers in Njombe urban and Wanging'ombe districts were getting a margin of Tshs. 51 and 22 per kg, which was the lowest gross margin compared to the other actors in the chain. The results show that the common rural-urban linkages were the flow of labour, fertilizer, output and financial services in the study area. Regression analysis model was used to analyze the determinants of Irish potato farmers' gross margin. The findings show that only 34% of the variation in Irish potato gross margin was due to the independent variables included in the model; gender, farm size, age, farm location, Income and irrigation were the main determinants of Irish potato farmers' gross margin. There were number of challenges that hinder the development of Irish potato value chain, it is recommended that government and non-government organization, researchers and small scale farmers should address these challenges so as to establish a profitable Irish potato value chain.

DECLARATION

I, Beatrice Daniel, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and has never been submitted nor concurrently being submitted for a higher degree award in any other institution.

…… …….

Beatrice Daniel Date

(MSc. Candidate)

The above declaration is confirmed by:

…… …….

Dr. F. J. Mishili Date

(Supervisor)

…… …….

Dr. E. Lazaro Date

(Supervisor)

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ACKNOWLEDGEMENTS

I am deeply grateful to the Almighty God who gave me the ability and empowered me for the completion of this report.

My genuine appreciation goes to my supervisors: Dr. F. J. Mishili and Dr. E. Lazaro for their constant advice, guidance, constructive and critical comments during the period of preparing this work. I feel privileged to have the opportunity to work under them. I also extend my deepest thanks to Rurban Africa project for funding this research.

My thanks are also extended to the Village Executive officers of Igagala, Ulembwe, Iwungilo and Ngalanga Villages, Mr. Isaya Kitaponda, Mr. Petro Luhasi, Mr. Joseph Muhule and Mr. Fadhili Mgaya for their support during data collection. Without them, the survey exercise would have been difficult.

Moreover, my great thanks go to my entire family for their generous assistance to accomplish this work. Finally I express my appreciations to all those who in one way or another helped me in the fulfillment of this work. May God bless them all.

DEDICATION

This work is dedicated to my lovely parents: Daniel, M. Makara and Germana, G. Kimbi, for their encouragement and sacrifices devoted to support me through my education.

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LIST OF ABBREVIATIONS AND SYMBOLS

ARI	Agricultural Research Institute
CIP	International Potato Centre
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistics
FGD	Focus Group Discussion
GM	Gross Margin
GMA	Gross Margin Analysis
ILO	International Labour Organization
Kg	Kilogram
Km	Kilometer
NJUCOBA	Njombe Community Bank
NMB	National Microfinance Bank
PZCT	Profit Zone Consultants Trainers
RPMA	Rapid Participatory Market Appraisal
SACCOS	Savings and Credit Cooperative Societies
SH	Southern Highlands
SMEs	Small and Medium Enterprises
SNAL	Sokoine National Agricultural Library
SNV	Netherlands Development Organization
SPSS	Statistical package for Social Science
TR	Total Revenue
Tshs	Tanzanian Shillings

TVC	Total Variable Cost
UN	United Nations
URT	United Republic of Tanzania
VEO	Village Executive Officer
VIF	Variance Inflation Factor
%	Percentage
<	Less than
>	Greater than

CHAPTER ONE

1.0 INTRODUCTION

1.1 Irish Potato Sub-sector

Irish potato (*Solanum tuberosum*) is the main root and tuber crop that have emerged as the fourth most important crop in the world after maize, rice, and wheat (FAOSTAT, 2009). Worldwide, more than 320 million tons of Irish potatoes are produced annually from 20 million hectares of land (FAO, 2010). The Irish potato is grown in more than 125 countries in the world; more than one billion people all over the world consume it after wheat and maize (International Potato Centre (CIP), (2008). Moreover Irish potato crop provides more nutritious food per unit land in less time and often under more adverse condition than other food crops (FAO, 2006). It is one of the most efficient crops in converting natural resources, labour and capital into a high quality food with wide consumer acceptance (FAO, 2010).

Almost a third of the world's Irish potatoes are produced in China and India (FAO, 2010). Until recently, Irish potato was relatively unknown and mostly regarded as a subsistence crop in many Developing and Least Developed Countries (Mwakanje, 2012). In Tanzania, Irish potato is becoming an important cash and food crop (Kelly, 2006). Irish potato was introduced in Tanzania during 1920s by German missionaries in the Southern Highlands (SH) of Tanzania, where local farmers began its cultivation in small scale gardens (Macha *et al*., 1982). Since its introduction, production trends have been increasing (FAOSTAT, 2007). Currently, Tanzania produces about 504 000 tons of Irish potato annually and most of this output comes from the Southern Highlands of Tanzania (URT, 2007).

Irish potato has great potential in both national and regional markets, due to growing demand for chips and snacks/crisps (Anderson, 2008). This growth in demand of Irish

potato can be traced to many factors, including increasing economic activities, busy urban lifestyles, increased number of fast food or takeaway restaurants, Introduction of food products that can be consumed on the street such as potato chips, fries and crisps. This is in addition to demand for prestige food in franchised restaurants, demand for prestige home-prepared food, increased tourism, and urbanization, all of which are shifting consumer's food preferences towards easy to cook and processed foods (Anderson, 2008; CIP, 2008; FAOSTAT, 2008). A Study by Kadigi et al. (2012) finds that most of the Irish potato markets of the final consumers are in urban; hence increase in Irish potato production can lead to the consolidation of rural-urban linkages. Tacoli (2004) argued that the flow of agricultural commodities occurs on both sides; that is agricultural commodity flows from rural to urban while manufactured goods flow from urban to rural. Tacoli (2004) mentioned that exchange of goods and services between rural and urban are an essential element to rural –urban linkages.

- **Rural and urban linkages**

Rural –Urban linkages refer to the flow of people, capital, and goods between rural and urban areas (UN, 2005; Zewdu and Malek, 2010). However, Okpala (2003) argued that it is important to add the flows of ideas, information and the flow of diffusions and innovation to the definition. Tacoli (2004) noted that the exchange of goods between urban and rural areas is an essential element of rural-urban linkages. Studies on rural-urban linkages indicate that the nature of the linkages differs from one place to another and across sectors (UN, 2005; Bukenya, 2010).

Rural-urban linkages are important to achieve balanced economic growth in rural and urban areas and it will encompass various kinds of resource flow such as labour, natural resources, commodity and financial flows, thus this interaction encompasses changes in livelihood strategies (Tostensen, 2004).

1.2 Problem Statement and Justification

Irish potatoes provide employment and are important in sustaining food security and livelihood for the majority of small scale farmers in rural areas. According to FAOSTAT (2014) data, local demand in Tanzania grew from about 508 000 Tons to 887 000 Tons in a period of 1995 to 2009. However, supply falls short of the demand, where by 508 000 Tons and 861 000 Tons were locally produced in 1995 and 2009 respectively in Tanzania. This left a gap of 62 tons and 26 000 tones which were filled via imports in the same period of time (FAOSTAT, 2014). Studies indicate that production of this crop has not been to its full potential to create a significant livelihood from selling Irish potatoes and its products (Namwata *et al*., 2010). Besides, due to lack of access to a reliable market and limited transformation, the expected benefits from Irish potato and its products has not been achieved. However, little has been done to develop Irish potato marketing system in Tanzania notwithstanding its importance to the rural people. In most cases, producers have no access to any up-to-date market information that would enable them to negotiate with buyers (Dereje, 2007 and Dendena *et al.,* 2009).

Rural-Urban linkage is the strategy for improving rural livelihoods, and increasing productivity and income (Idowe *et at.*, 2008). Trends in flows of human resources, goods, money, information and different professionals reflect dynamic processes of economic, social and cultural transformation which need to be better understood. Therefore, this study was conducted with the aim of analyzing the Irish potato value chains so as to find the areas for intervention which will improve small-scale farmers' access to reliable markets in the study area, as well as to describe the contribution of rural and urban linkages in the production and marketing of Irish potato. Besides filling the existing research gap, the findings of this study will also help the local value chain players and

supporters to improve their livelihood in the study area, as well as development partners and planners to better target investments in Irish potato sub-sectors.

1.3 The Objectives of the Study

1.3.1 Overall objective

The overall objective of this study was assessment of Irish potato gross margin of the various actors and economic linkages between rural and urban areas so as to explore the available potential market opportunities for Irish potato value chain actors.

1.3.2 Specific objectives

Specifically the study intended to:

i. Map the Irish potato value chain in Njombe urban and Wanging'ombe district.
ii. Determine gross margin of Irish potato among actors involved in the value chain.
iii. Identify the economic linkages between rural and urban areas.
iv. Determine factors influencing Irish potato farmers' gross margin in the study area.

1.4 Research Questions

i. What are the major characteristics of Irish potato value chains in Njombe urban and Wanging'ombe district?
ii. What is the gross margin of the Irish potato actors involved in the value chain?
iii. What are the economic linkages between rural- urban areas?
iv. What are the factors influencing Irish potato farmer's gross margin in the study area?

1.5 Significance of the Study

The study will provide information on the gross margin of Irish potato to every actor along the chain. The findings of this study will benefit Irish potato farmers, processors and traders, policy makers, and governmental and non-governmental organizations that have a stake in Irish potato production and marketing system and plan for interventions in the future. The study will also help development planners and policy makers in designing appropriate policies for marketing in the Irish potato subsector that will improve both rural and urban livelihood hence alleviate poverty.

1.6 The Conceptual Framework

The study adopted and modified conceptual framework that was developed by Mwakanje (2010) which has the component of the value chain. The value chain starts with input suppliers to Irish potato farmers to village traders, transporters, wholesalers, retailers, processors and end up with the local consumer of Irish potato products as shown in Fig. 1. According to this framework, a farmer sells to village traders, wholesalers and urban trader, the three players in the chain can sell the product to wholesaler, retailer, processors and consumers. In addition, the wholesaler can supply the crop to the retailer who, in turn, sells the crop to the processors and finally to final consumer. It is argued that the farmer's gross margins are determined by the number of variables in the study area.

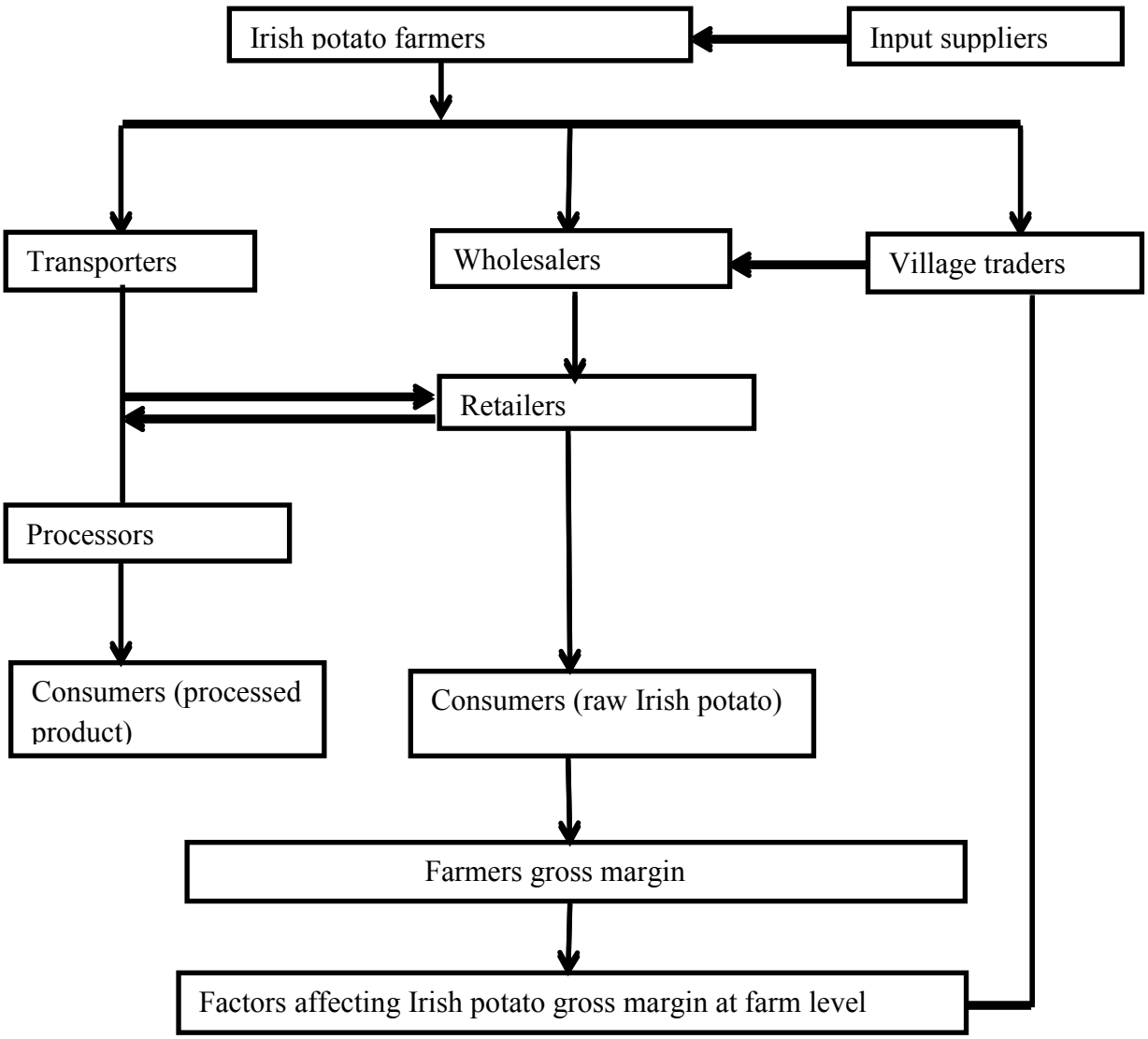

Figure 1: The conceptual framework for analyzing Irish potato value chains in Njombe and Wanging'ombe districts

Source: Modified from Mwakaje (2010)

1.7 Organization of the Study

This study is organized in five chapters. Chapter two gives a critical review of the literature relevant to the study while the third chapter presents a detailed description of the study area and the methodology employed. The fourth chapter presents results and discussion while the last chapter presents conclusions and recommendations drawn from the study findings.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definitions of Terms and Concepts

2.1.1 Rural – urban linkages

Rural –Urban linkages refer to the flow of people, capital and goods between rural and urban areas (UN, 2005; Zewdu and Malek, 2010). However Okpala (2003) argued that rural-urban linkages refer to the growing flow of public and private capital, people (migration and commuting) and goods (trade) between urban and rural areas. In developing countries the relationship between urban and rural area sector is characterized by an economic dualism which is the coexistence of a modern and a traditional rural sector (Fan *et al.,* 2005). Many small towns have positive effect on rural development and agricultural productivity through a flow of a range of goods and services (Meijerink and Roza, 2007; Owusu, 2005). Urbanization, population growth and declining returns from agriculture for small farmers mean that rural-urban interactions and linkages play an increasingly important role in local economies and in the livelihoods of large number of people (Tacoli, 2002; Gete, 2007; Meijerink, 2007).

2.1.2 Value chain concept

Brown (2009) defined value chain as the set of interconnected, value-creating activities undertaken by an enterprise or group of enterprises to develop, produce, deliver and service a product or service. Value chain describes the full range of activities required to bring a product or service through the different phases of production, including physical transformation, the input of various producer services, and response to consumer demand (Kaplinsky *et al.,* 2000). As such, value chains include the vertically linked interdependent processes that generate value for consumer. When comparing value chain to supply chain,

the term supply chain is used internationally to encompass every activity involved in producing and delivering a final product or service, from the supplier's supplier to the consumer's consumer (Feller *et al.,* 2006).

Other authors (Stevenson and Pirog, 2008) define the term 'value chain' from a food supply chain's perspective (i.e. value added) as a new point of a food product which has been converted from raw products, through processing resulting in a different product form and hence the incremental value in the market place. Furthermore, 'the word value and values' are used to characterize the nature of business relationships among interacting food business enterprises and these values-based relationships are then called value chains.

The primary focus of supply chains is on cost and efficiencies in supply, while value chains focus more on value creation, innovation, product development and marketing. While both concepts describe the same network of companies that interact to deliver goods and services, the value chain is essentially about value (Austin Associates, 2009).

A value chain depicts the many activities involved in getting products from the producer to the consumer. These activities occur in a sequence and are carried out by different participants, including farmers, traders, processors, retailers and consumers. Each link in the value chain adds value to the product.

2.1.3 Value chain analysis

Value chain analysis includes critical examination of the value added along the chain, the stage it is added and at what cost with the aim of improving the chain to create more value hence more benefits to the value chain participants (PZCT, 2010). Kotler and Armstrong (2006) defined value chain analysis as a study of a series of departments that carry out

value creating activities to design, produce, market, deliver and support firm's products. According to Dooren van Corne (2005) value chain is the examination of the value added steps in production and marketing, with the value also being assessed from social perspective resulting into social value. Social value is the chain that tracks social costs and benefits, and the value is not just the cash price received but fulfillment of several social standards and has to do with preferences of social quality (Dooren van Corne, 2005). According to McKay *et al*. (1997) value chain is the study of a full range of activities which are required to bring the product or service through intermediaries phase from production to final consumers. Goletti (2006) reported that value chain analysis ideally requires dealing with all participants along the value chain.

2.1.4 Value chain mapping

Mapping a value chain means creating a visual representation of the connections between businesses in value chains as well as other market players (ILO, 2009). Mapping Value chain has very practical implications for a value chain initiative which are: It helps to illustrate and understand the process by which a product goes through until it reaches the final customer. Knowing about the different levels in a value chain is also a precondition for identifying bottlenecks that are preventing the achievement of certain targets. It also serves as a way of identifying and categorizing key market players. If a value chain initiative intends to explore market opportunities, value chain maps can show up differently market channels through which products and services reach the final customer. A value chain map can help companies investing in emerging markets to orient their activities such as to identify important stakeholders, possible marketing or supply channels, competitors, weak links in the chain.

2. 1.5 Market and marketing

Traditionally, market can be defined as a specific geographical area where buyers and sellers meet for exchange of goods and services (Zeberga, 2010). The most common way of obtaining goods and services that are not produced in a particular area is to buy such goods and services from another area that specializes in producing it. According to Escolar (2005) market refers to the situation where by producers and consumers exchange the commodity at mutually agreed prices. Market can also be a place where producers and consumer emerge to sell and buy commodities. Market participants may also engage in moving, storing, grading and processing the commodity in expectation of improving its value to consumers. Ngwasy (2007) defines marketing as the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods, services, organization and events to create exchange that will satisfy individual and organizational objective.

Another basic concept that is closely related to market is marketing. The term marketing has been a very debatable concept and defined in so many different ways by different scholars (Zeberga, 2010). This is because marketing, or more specifically agricultural marketing, projects different impression to different groups of people in a society, like farmers, traders and consumers (Kohls and Uhl, 1985). Marketing can also be defined as a system because marketing usually comprises of several interrelated structures along the production, distribution and consumption units underpinning the economic process (Mendoza, 1995). According to Ringold and Weitz (2007), marketing involves all of the business activities performed in directing the flow of goods and services from the producer to the consumer or final user. These activities are usually classified into six stages. These are: production, assembly, processing, wholesaling, retailing and consumption.

2.1.5.1 Marketing channels

The analysis of marketing channels intends to provide a systematic knowledge of the flow of goods and services from original producers to their final consumers (Mendoza, 1995). Most frequently a physical product transfer is involved, but sometimes an intermediate marketing institution may take title to goods without actually handling them. These intermediaries constitute a marketing channel also called a trader channel or distribution channel (Tekele, 2010). It is argued that if marketing channels are efficient, they will induce farmers to become more commercialized (Ashimogo, 1995). The channel system creates time, place, possession and form utilities.

2.1.5.2 Marketing system

A marketing system is a collection of channels, intermediaries, and business activities, which facilitate the physical distribution and economic exchange of goods (Kohls and Uhl, 1985). It can also be defined as the network of buyers, sellers and other actors that come together to trade in a given product or service. Kotler (1980) defined marketing system as a set of interacting participants, markets and flows that are involved in an organized area of exchange or is a chain of business units or other organizations that take the product from its inception to its ultimate markets, it may include the retailers, wholesalers and agents in the channel of distribution. The participants in the marketing system includes direct market players, product, buyers and consumers who drive economic activity in the market it also include suppliers of supporting goods and services such as finance, equipment and business consulting and finally the entity that influence the business environment such as regulatory agencies, infrastructure providers and business associations.

2.2 Irish Potato Marketing and Value Chain

2.2.1 Irish potato value chain in Africa

Ferris *et al*. (2003) provide an overview of the Irish potato marketing system in Uganda and an analysis of the role for Irish potato within the government of Uganda's newly devised export strategy. They found that the international market for potatoes has five main products including (i) seed potato, (ii) ware potatoes (iii) frozen chips (iv) crisps / snacks and (v) starch / other miscellaneous products. The frozen chip and snack markets have shown the highest rates of growth in the past decade and it is most likely that frozen chips will continue to be the leading area of growth in the next decade (Ferris *et al.,* 2003).

Ferris *et al.* (2003) also argued that like many other commodities in Uganda, the Irish Potato sector is not well organized or integrated. Producers, transporters, marketers, wholesalers and retailers are fragmented and tend not to cooperate. There are very few organizations and the ones that do exist are small and young. The lack of organization is one factor that isolates the sector from regional or global markets. The study also found that Ugandan potato production is constrained by lack of inputs including clean seed, fertilizers and pesticides. There are no commercial stores and no cold chain facilities. There is a general lack of organization in the marketing chain, particularly amongst producers and this leads to considerable price instability. Due to lack of transparency and poor market structure, brokers are able to charge excessive fees for their services and travelling traders make the bulk of the profit in the supply chain. Furthermore Ferris *et al.* (2003) found that Irish potato marketing channel in Uganda comprises of nine actors that are; farmers, village traders/assemblers, brokers, travelling traders, wholesaler, retailers, processors and final consumers.

Omiti and Laibuni (2014) carried out a study on market structure and price of Irish potato markets in Kenya. The researchers found that in Kenya, food markets are characterized by

information asymmetry, inadequate storage and transport infrastructure and weak physical and institutional market organization. This study also examined recent trends in domestic Irish potato prices in the production markets of Nakuru and Eldoret and the consumption markets of Nairobi and Mombasa, and investigated the relationship between market structure and price of Irish potato in the different markets. The study showed that there is a general rise in the price of potatoes. The farm-gate share of wholesale market prices for ware (fresh) potato increased in Nakuru and Eldoret by 52% in 2010 from 35% in 2009. These percentage shares suggest that there exist large marketing margins that are accrued by middlemen and brokers.

Omiti and Laibuni (2014) also found that Irish potato markets are oligopolistic in nature, that is, few market participants in the form of rural brokers, urban brokers and transporters have the market power. There are barriers to entry at the urban market centers where brokers provide the link between wholesalers and retailers. In many cases, brokers and transporters determine the market price for each potato consignment. The markets are integrated and price transmission does occur, however it is incomplete.

The results showed that long run price transmission proportions range between 25% and 59%, implying that, the spatial arbitrage conditions are wanting in the markets that were examined. Proposed interventions include facilitation and up-scaling of market information sharing; investment in physical infrastructure (including storage and roads) to facilitate trade; and provision of incentives to encourage public-private partnerships in storage, distribution and marketing. Omiti and Laibuni (2014) noted that from a policy perspective, efforts should be made to facilitate arbitrage through the improvement of storage and physical market infrastructure.

Makoni *et al.* (2014) investigated the impact of value chain constraints on smallholder Irish Potato farmers in Nyanga district in the eastern province of Manicaland in Zimbabwe. The results expose value chain bottlenecks which impend access to high value potato markets. The study used Rapid Participatory Market Appraisal (RPMA) and semi-structured interview questionnaire as the dominant data collection instruments. Makoni *et al.* (2014) found out that the core actors in the Nyanga smallholder Irish potato value chain included input suppliers, business services developers (market linkage and production support), the Irish potato farmers themselves and the fresh potato commodity buyers. Results also show that the value chain presents several constraints for the smallholder Irish potato farmers which are inability to afford transportation of both inputs and produce. The road network was poor and the few truckers who came to the area charged high fees which the farmers could not afford. As the smallholder potato middlemen lies in the middle of the value chain, they usually exploit farmers by raising the exorbitant transportation charges. These middlemen command the prices at which to sell seed and other fertilizer and chemical inputs to farmers and at the same time dictate the prices at which to buy produce from the same farmers. The study also found that Irish potato supply chain constraints are thus hindering farmers from accessing high value markets in the absence of farmer consortiums through which collective bargaining especially in relation to transportation could be negotiated.

2.2.2 Irish potato marketing and value chain in Tanzania

Kabungo (2008) did the evaluation of Irish potato and marketing performance in Tanzania specifically in Mbeya rural district. Specifically the study aimed at determining economic profitability of Irish potatoes grown by small scale farmers. Gross margin analysis was used to measure enterprise profitability across different actors. The results show that farmers earn Tshs. 253 403.90 per acre, transporters, wholesalers and retailers received a

profit of Tshs. 2 051 344.90, Tshs. 461 029.40 and Tshs. 121 675.00 per week respectively. The study also identified four major marketing channels in the Irish potato marketing system that are;

Farmers →Village traders →Urban brokers →Wholesalers → Urban retailers → consumers

Farmers → Rural brokers → Travelling agents → consumers

Farmers → Rural retailers → Rural consumers

Farmers→ Rural consumers

Kabogo (2008) also urged that traders face a number of marketing problem that affect their performance hence contribution to the economy. The problem with the gross margin was that the unit used to measure profitability was not the same; the researcher uses Tsh per acre for farmers, while for other actors uses Tsh per week.

Moreover Mwakanje (2012) did the study on analysis of round potato marketing in Tanzania specifically Rungwe district in Mbeya. The study aimed at finding out the relative benefits obtained by different actors in the round potato marketing chain in Tanzania, as well as investigates factors that affect the crop profitability. Mwakanje (2012) found that farmers earned only 8% of the total gross margin (GM) compared to 30.9% for the wholesalers. As such, farmers were receiving lower gross margin than wholesalers especially those who used to transport round potato to Dar es Salaam market. The study also did the regression analysis to determine factors affecting gross margin, it was revealed that household size had positive relationship with Round potato gross margin and it was statistically significant ($p<0.05$), selling volumes ($p<0.0.05$) and selling price ($p< 0.01$) had significant effect on the crop gross margin.

Mwakanje (2012) recommended that the government should enhance farmer's bargaining power through providing indicative prices, encouraging farmers to form groups and reducing transport costs through improved roads. Further, she also claim that the government should ensure that farm inputs are available to the farmers in time and in good quality and to improved round potato productivity through improved extension services.

2.3 Theoretical Framework and Empirical Methods

2.3.1 Sub-sector mapping

A Subsector is defined as a vertical grouping of enterprises involved in the production and marketing of one well-defined product or several closely related products (Boomgard *et al.,* 1992). It can also be defined as an aggregation of alternative channels through the production/distribution system for one or a group of closely related products. A Subsector also includes a set of economic activities that cuts across several sectors, often the agricultural, industrial and commercial sectors. The Subsector approach is a "systems" approach to the study of economic activity. It emphasizes the interdependence of economic units, particularly those involved in the production and distribution process. This interdependence is seen as playing a central role in understanding the dynamics of change and evolution. The tools of sub sector research are similar to those employed in other economic and business studies. They are applied, however, in a setting which affects the choice of questions asked as well as the way in which these questions are analyzed.

The map illustrates the movement of a product from its beginning as raw material until it ends as a finished product in the hands of consumers; it involves a progression trough a production/ distribution system. There are several components that should be illustrated in the map which are:

Markets: Markets are the final destination of the product. This can be defined either by location, such as domestic or international or by the type of consumer.

Functions: Each step that the product goes through during the production and distribution system is referred to as a function.

Participants: Participants are the key actors and their roles within the subsector.

Channels: Channels are made up of participants, differentiated by technologies, functions and linkages. Goods flow to the market through different channels.

Subsector analysis can be seen as very similar to value chain analysis; the terms are often used interchangeably. However, advocates of the Global Commodity Chain school of Value Chain Analysis see subsector analysis as being restricted to activities within national boundaries. Moreover, subsector analysis remains an important tool in any subsector program (Lusby, 2002). It help to determine what the major constraints/ opportunities are for increased growth and provides a basis for identifying support initiatives that can impact large numbers of Small and Medium Enterprises (SMEs).

- **Empirical studies on sub-sector mapping**

A study by Mmasa *et al.,* (2011) aimed at mapping the sweet potato value chain linkages between actors, processes and activities in Tanzania specifically in Shinyanga Rural and Mwanza Urban districts. The study used cross sectional design, Sub-sector mapping analysis and content/context analyses. A map obtained was generated to show that three main marketing channels exist in the study area: Producers selling directly to consumers; producers to retailers to consumer; and producers to hawkers/village vendors to consumers.

Mathuva (2005) carried out value chain of the indigenous poultry sub-sector in Kenya. The study used mapping procedure to assess the linkages between functions and participants as well as channels existing in indigenous poultry. A map shown that there are five participants in the chain that are; producers, traders, transporters, wholesalers, retailers and final consumers, where by there were three differentiated categories of producers although they were existing in the same environment and interact extensively. The main category composed of individual producers followed by informal breeder and producers groups.

SNV (2009) carried out value chain analysis study for the structure of beekeeping sub-sectors in Rwanda. Mapping procedure was used to assess the existing vertical and horizontal linkages within the sub-sector as well as functions and roles of actors from input supply to the final consumers. Thus, in this study sub-sector mapping analysis was adopted to identify the key value chain stakeholders in the chains and how were connected to each other.

2.3.2 Profit maximization theory

According to Dutta and Radner (2003) the profit maximization theory assumes that peasants are profit maximizing economic agents and are thus efficient producers. The process of decision making of a peasant family involves production and consumption aspects, another theory like the risk-averse peasant theory argues that poor small farmers are necessarily risk-averse and they attempt to increase family security rather than maximize profit (Mendola, 2005). Rweyemamu (2001) argues that as small-scale farmers operate in a household economy, consumption and production decisions are assumed to be independent. A small-scale producer is assumed to choose the level of output for each distribution channel in a manner that maximizes profits (Blandon *et al.,* 2007). Therefore

the most profitable segment along Irish potato value chains will attract capital relative to the lower profitable segments.

2.3.3 Gross Margin (GM)

The gross margin for a farm enterprise is one measure of profitability that is a useful tool for cash flow planning and determining the relative profitability of farm enterprises. They can also be used to assist in assessing the opportunity to develop new farm enterprises. Gross margin is the difference between the annual gross income for that enterprise and the variable costs directly associated with the enterprise. In constructing gross margins, fixed (overhead) costs are ignored, as it is considered that they will be incurred regardless of the level of the enterprise undertaken (Rural Solutions, 2012). The gross margin of different enterprises should not be compared if they have different overhead costs. The normal profit obtained is the last payment a trader or the owner of the enterprise would be willing to accept for performing the entrepreneurial functions. Thus, receiving a normal profit is important in order to keep the trader or the owner from withdrawing the capital and managerial effort and putting it into another alternative business (Kotler and Armstrong, 2006).

GM can be expressed as a ratio or in percentage in order to compare the profitability of enterprises at different stages (Mendoza, 1995). Therefore, the GM, when expressed as ratio or percentages is given by;

$$GM(Percentage\ /\ Ratio) = \frac{Total\ \mathrm{Re}venue(TR) - TotalVariableCost(TVC)}{Total\ \mathrm{Re}venue(TR)} \quad \text{.....(1)}$$

The expression above cannot be used to show the normal value of the earnings of the enterprises and cannot be used to measure profitability of non-production enterprises.

However, the expression is useful for comparing profit across different enterprises and different segments along the value chain (Mendoza, 1995). Therefore, GM analysis has been used to identify returns (profit) obtained by traders at each stage along Irish potato value chains.

- **Empirical studies on gross margin analysis**

The study done by Eskola (2005) used Gross margin to analyse profit for rice in Ifakara and Dar es Salaam markets. The findings show that local traders and brokers of rice in Ifakara market obtained a profit of 10 - 20% per kg. Large scale trader obtains a profit of Tshs. 20 000 per trip to buy goods from the region, rice wholesalers at Kariakoo markets obtained a profit of Tshs. 10 000 to 15 000 daily and rice wholesalers at Tandale market obtained a profit of Tshs. 40 – 48 per kg. The limitation of the method is that it does not have a uniform unit of profitability measurement across the different traders. Further, traders are not grouped into homogenous groups performing similar functions which might be misleading and difficult to interpret when attempting to formulate policy.

Ponte (2002) argued that GM has several disadvantages including failure to include fixed costs, and failure to make allowances of costs for depreciation and obsolescence of fixed assets. However, Phiri (1991) contends that GM is still the most satisfactory measure of resource efficiency to SMEs. It gives a good indication of the financial health of enterprises and shows the deep insight into trader' management efficiency of the enterprise (Hammod, 2001). Despite the weaknesses of GM as a measurement of profitability, it remains the most satisfactory measures of resources efficiency.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area and Justification for Selection

The study was conducted at Njombe urban and Wanging'ombe districts in the Southern highland of Tanzania. Wanging'ombe and Njombe Urban Districts were purposefully selected because of the high production of Irish potato in the southern highlands of Tanzania (URT, 2013). Two villages were selected from each district. Igagala and Ulembwe villages in Wanging'ombe district, Iwungilo and Ngalanga villages in Njombe Urban district. According to 2012 National census the total population of Njombe region is 702 097, while Njombe urban district has the total population of 309 797 and Wanging'ombe district has the total population of 161 816 people (URT, 2013). The location of the study area is presented in Fig. 2.

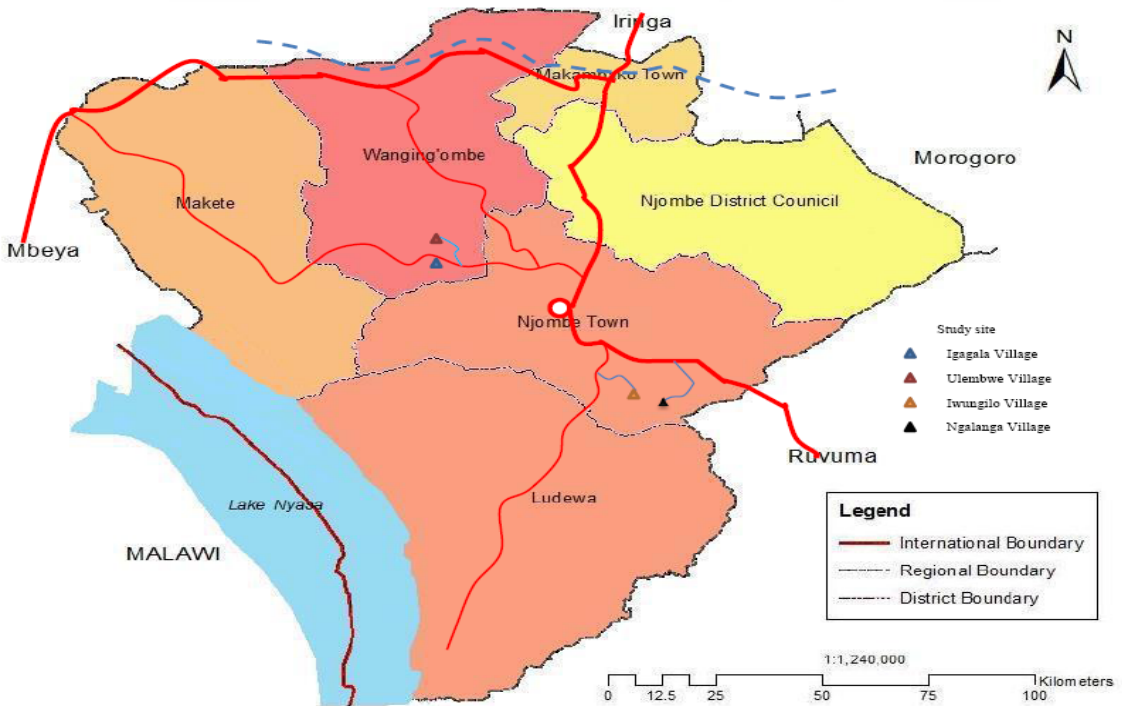

Figure 2: Sketched map of Njombe region indicating selected site village

Source: Modified from URT (2013)

- **Economic activities**

Food crops such as maize, beans, green peas, wheat, cabbages and avocado are predominant in Njombe Urban and Wanging'ombe districts. These crops are cultivated using mainly hand hoes on small family plots. Irish potato, maize, and apples are grown as cash crops by small holder farmers, Irish potato ranks as the first cash crop in Njombe Region.

3.2 Research Design

The study employed a cross sectional research design. Cross sectional data were collected from producers' households and all participants at wholesale, retail, processors and consumer level. This design was chosen because it allows collection of detailed data on respondents at one point in time; it is also suitable for description purposes as well as the determination of relationships between variables (William, 2002).

3.3 Sampling and Sample Size

3.3.1 Selection of sampled wards and villages

The districts selected for the study were Wanging'ombe and Njombe Urban districts. A purposive sampling procedure was employed to select two districts. Four villages were selected randomly from two districts (Table 1).

Table 1: Sampled districts, ward and villages

District	Ward	Village
Wanging'ombe	Ulembwe	Igagala
		Ulembwe
Njombe Urban	Iwungilo	Iwungilo
		Ngalanga

3.3.2 Selection of farmers

The list of Irish potato producers was obtained from Village executive officers (VEO) from respective villages. In sampling Irish potato farmers, a systematic sampling technique was employed to select farmers to be interviewed. The sample of this category of respondents was formed by a total of 130 producers.

3.3.3 Selection of traders (Wholesalers and Retailers)

A snowball sampling method was used in obtaining traders. This sampling method technique was used because members of these populations have not been previously identified, in this case traders were asked to identify their fellow traders who were then selected for the survey in Njombe urban and Wanging'ombe districts. The list of wholesalers and retailers interviewed formed a sample of 31.

3.3.4 Selection of processors

A snowball sampling method was employed in obtaining processors involved in this study. This sampling technique can be defined as "a non-probability sampling technique in which the researcher makes initial contact with a small group of people who are relevant to the research topic and then uses these to establish contacts with others" (Bryman, 2008). Snowball sampling is a method typically used with unknown or rare populations in this case processors were asked to identify their fellow processors who were then selected for the survey in their processing outlets in Njombe urban. A snowball sampling technique was adopted because members of these populations have not been previously identified, hence they were more difficult to locate or contact than known populations (Coleman, 1958; Goodman, 1961; Spreen, 1992). The list of processors interviewed was thus obtained from the respective district markets in Njombe and Makambako formed a sample of 20 processors.

3.3.5 Selection of consumers

Irish potato consumers were selected randomly while performing transactions with retailers and processors at Njombe town. The total number of consumers interviewed was 21.

3.4 Sample Size

The sample size was determined using precision criteria determination of the sample based on the precision rate and desired confidence interval (Kothari, 2008).

The estimated sample size is given as $n = \frac{Z_{\alpha/2}{}^2 P(1-P)}{\varepsilon^2}$ .....(2)

Whereby $n =$ sample size, $Z =$ proportion of standard normal distribution which is 1.96 for 95% confidence level, $P =$ expected proportion of the respondent taken as 5%, $\varepsilon =$ allowable margin of error for this study is 3%; from the above formula sample size was 202.

3.5 Methods of Data Collection

3.5.1 Primary data

Primary data was obtained using a structured questionnaire, which was administered to respondents in the form of open and closed ended questionnaire and Focus Group Discussion. The questionnaires were designed for producers (farmers), processors, traders and consumers of Irish potato potatoes (Appendices 1 - 4). A total of four Focus Group Discussions were conducted in four villages.

3.5.2 Secondary data

Secondary data were obtained from books, journals, research studies and dissertations at Sokoine National Agricultural Library (SNAL) and internet, Ministry of Agriculture Food

Security and Cooperatives. The information collected included round potato production trends, production technologies, production constraints, opportunities for potato crop.

3.6 Data Processing and Analysis

The data collected from Irish potato producers, processors, traders and consumers were coded for analysis. The options for the close ended questions were assigned numbers while in open ended questions all possible answers were identified and summarized. The primary quantitative data collected were analyzed using the Statistical Package for Social Sciences (SPSS) software. Data were analyzed by computing descriptive statistics to determine frequencies, percentages, and means. For objective one which is mapping the Irish potato value chain, sub-sector mapping was used, gross margin analysis was used for the second objective which is to determine gross margin of Irish potato among actors involved in the value chain, Multiple linear regression analysis was used to determine factors influencing Irish potato farmer's gross margin.

3.6.1 Sub-sector mapping

Sub-sector mapping was used to map Irish potato value chain linkages between actors, processes and activities in the value chain as well as product flows in the chain**.** The aim was to visualize networks in order to get a better understanding of the connections between actors and processes in a value chain. The analysis was also used to demonstrate the interdependency between actors and processes in the value chain and create awareness of stakeholders to look beyond their own involvement in the value chain (Michael *et al.,* 2010).

3.6.2 Gross margin analysis

Rogan (2004) defined gross margin as the difference between total revenue and total variable costs. It is used as a measure of enterprise profitability and means of selecting

farm plans. The size of gross margin depends on the services provided, market structure, market price, perishability of the product as well as the distance between producers and consumers and may be influenced by market information especially for short-run margins. According to Rogan (2004) Gross Margin Analysis (GMA) is one of the widely used analytical techniques for planning and analysis of projects by advisors, consultants, researchers and producers. Therefore, Gross Margin Analysis (GMA) was used to estimate profit for Irish potato actors. GM was calculated using the following formula:

$$GM = \Sigma P_i Q_i - \Sigma C_j X_{j.} \quad \text{.....(3)}$$

Whereby:

GM = Gross Margin

P_i = Unit price of product i

Q_i = Quantity produced of product i

C_j = Unit variable cost of input j

X_j = Quantity of input used

$P_i Q_i$ = Revenue

$C_j X_j$ = Variable cost

3.6.4 Determinants of Irish potato gross margin

A linear regression model was used to analyze the determinants of farmers' gross margin whereby farmers' gross margin was taken as a function of gender, education level, age of the household head, area under Irish potato cultivation, loan, income from other sources, irrigation, membership to farmers group and farm location in km (distance from farm to the main market). The model for gross margin was specified as follows:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \mu \text{.....(4)}$$

Whereby:

Y	=	Gross margin (Tshs/kg)
α_0	=	The intercept of the regression equation,
$\beta_1 - \beta_4 and \alpha_1 - \alpha_5$	=	Parameters to be estimated,
X_1	=	Farm location was expressed as the distance the Irish potato plot is from the main market in km,
X_2	=	Area under Irish potato cultivation in acres for 2013/2014 growing season,
X_3	=	Age of the household head
X_4	=	Total income (Tshs) received in a family excluding income from Irish potato
D_1	=	Gender of the household head (1= male 0= otherwise)
D_2	=	Educational level (1= primary school 0= otherwise)
D_3	=	Credit provided to farmers (1=Yes 0=otherwise)
D_4	=	Membership to farmers group (1= Yes, 0= otherwise)
D_5	=	Irrigation (if the land is in irrigation or rain fed) (1= irrigated 0= rain fed)
μ	=	Error term

Table 2: Expected signs for the coefficients

Variable	Coefficient	Expected sign
Farm location (Frmloc)	β_1	-ve
Gender (gen)	α_1	+ve
Area (frmsz)	β_2	+ve
Irrigation (IRR)	α_2	+ve
Framers group (fgrp)	α_3	+ve
Age	β_3	-ve
Income	β_4	+ve
Education (edu)	α_4	+ve
Loan	α_6	+ve

3.7 Limitation of the Study

Some limitations were encountered during field interviews. Most of the urban respondents particularly traders and processors were reluctant when asked to give information on costs and return for their business. This might be associated with their belief that, this information was asked for taxation purposes. In overcoming this limitation, an assurance was given to them that the information would be treated confidential and was not for taxation purposes. Nevertheless, they provided information on buying prices and cost incurred.

CHAPTER FOUR

4.0 RESULTS AND DISCUSION

4.1 Overview

Descriptive statistics of the variables used are discussed in this chapter. The chapter begins by presenting socio-economic characteristics of actors at each node in the value chain, mapping of Irish potato value chain, Irish potato marketing channels, Gross margin analysis of Irish potato at each node, the role of rural and urban connection and the determinants of Irish potato profitability at farm level.

4.2 Socio-economic Characteristics of Respondents

The term actor refers to any person (farmer, trader, processor, transporter and consumer) who plays a role in the value chain. This section describes the socio-economic characteristics of actors at different nodes in Irish potato value chain. The characteristic that were examined in the study included age, sex, marital status and education level for Irish potato producers, traders, processors and consumers.

4.2.1 Socio-economic characteristics of producers

The findings show that the majority of respondents' ages were greater than 44 years (Table 2). This suggests that middle age group is more active in potato production compared to younger group. Kabungo (2008) reported that age has influence on round potato production since activities associated with its production are very tough hence require energetic people.

The findings show that, male headed household were dominant making 70% of the Irish potato farmers (Table 2). Patriarchy and male dominance in decision making in many

African societies have resulted into most households being led by men (Duze and Mohammed, 2006). It has widely been shown in Africa that when a crop is perceived as profitable, men are more likely to take over from women (World Bank, 2009). Apart from gender the findings also indicated that majority (70%) of Irish potato producer had attained primary school. Similar results were reported in URT (2005) on the study that assessed agricultural marketing information where the study concluded that, there was a large number of farmers who have primary education and below.

Table 3: Socio-economic characteristics of producers

Characteristics	Frequency	Percent
Age (Years)		
15-24	1	1
24-34	36	28
35-44	35	27
>44	58	45
Total	**130**	**100**
Sex		
Female	39	30
Male	91	70
Total	**130**	**100**
Education level		
No formal education	31	24
Primary education	91	70
Secondary education	8	6
Total	**130**	**100**

4.2.2 Socio-economic characteristics of traders

The socio-economic characteristics of Irish potato traders in Njombe urban and Wanging'ombe districts are presented in Table 3. The findings show that the majority of Irish potato traders aged between 35- 44 years. This implies that most of Irish potato

traders were within the economically active age. These findings agree with the study done by Adinya *et al*., (2008) which found that people in age groups of 21 - 60 are more economically active and independent than those in the age group of less than 21 years and above 60 years.

Concerning gender of the respondents, results show that 55% were females who dominated the business in Njombe (Table 3). This implies that women are known to participate in agricultural business than men.

Regarding marital status it was found that 81% of the traders in Njombe urban were married (Table 3). Given the very low rate of single and widowed household heads, this might imply that the majority of the respondents would have additional responsibilities for their spouses and children. A study by Kayunze *et al*. (2014) indicated that marital status has positive implication on social organization and economic activities such as agriculture and resource management. In addition, 94% of Irish potato traders have attained primary education as illustrated in Table 3.

Table 4: Socio-economic characteristics of traders

Characteristics	Frequency	Percent
Age(years)		
15-24	3	10
25-34	9	29
35-44	14	45
>44	5	16
Total	**31**	**100**
Sex		
Female	17	55
Male	14	45
Total	**31**	**100**
Marital status		
Married	25	81
Single	2	6
Widowed	4	13
Total	**31**	**100**
Education level		
No formal education	1	3
Primary education	29	94
Secondary education	1	3
Total	**31**	**100**

4.2.3 Socio-economic characteristics of processors

The socio-economic characteristics of Irish potato processors are presented in Table 4. Findings show that the majority of the Irish potato processors in Njombe urban aged between 35 and 44 years. This indicates that most of the processors were of middle age, the age at which they were still energetic and active and hence could actively be involved in many agricultural activities (Kayunze *et al.,* 2007). The findings also indicates that majority of the Irish potato processors were female (85%), this indicate that most of the

female in Njombe were involved in small businesses like chips vendors and crisps maker. Regarding marital status, approximately half of the women involved in processing activity were married, the findings also indicated that 75% of the processors had attained primary education (Table 4); The implication of these results is that the majority of processors were literate enough to adopt and use innovative technologies. Other studies done by Hawassi (2006) and Nkuba (2007) found that educational level influences market access.

Table 5: Socio-economic characteristics of processors

Characteristics	Frequency	Percent
Age(years)		
15-24	2	10
25-34	7	35
35-44	4	20
>44	7	35
Total	**20**	**100**
Sex		
Female	17	85
Male	3	15
Total	**20**	**100**
Marital status		
Married	10	50
Single	5	25
Widowed	5	25
Total	**20**	**100**
Education level		
Primary education	15	75
Secondary education	4	20
Tertiary education	1	5
Total	**31**	**100**

4.2.4 Socio-economic characteristics of consumers

The findings show that the majority of the Irish potato consumers are young, mainly aged between 15- 34 years. The implication of this is that young people looking for convenience and quick foods such as chips and crisps. Regarding gender the findings show that most of the consumers were male because in Njombe urban and Wanging'ombe districts the people who did the majority of shopping in the household were male (Table 5).

The findings show that majority of Irish potato consumers (57%) in Njombe were single. This implies that most of the people who are single prefer eating fast food like chips and bites (crisps) which are Irish potato products because it is simple to cook and takes shorter time to prepare. Majority of Irish potato consumers had attained primary education (Table 5). Enitan (2010) reported that education is an important variable that tends to influence the choice of food commodities consumed by individuals and households.

Table 6: Socio-economic characteristics of consumers

Characteristics	Frequency	Percent
Age (Years)		
15-24	9	43
25-34	9	43
35-44	3	14
Total	**21**	**100**
Sex		
Male	11	52
Female	10	48
Total	**21**	**100**
Marital status		
Married	9	43
Single	12	57
Total	**21**	**100**
Education level		
Primary education	14	67
Secondary education	5	24
Tertiary	2	9
Total	**21**	**100**

4.3 Mapping of Irish Potato Value Chain

4.3.1 Irish potato value chain

Irish potato value chain is complex with multiple products and comprises of a number of participant (actors) such as input suppliers, small-scale farmers, transporters (agents), local processors and retailers of fresh Irish potato (Raw) as well as processed Irish potato. This shows high intensity of value addition and complex interactions among actors and chain service providers in Njombe urban and Wanging'ombe districts. A range of production

and marketing functions undertaken in the Irish potato value chain are production, transportation, processing, retailing and consumption (Fig. 3).

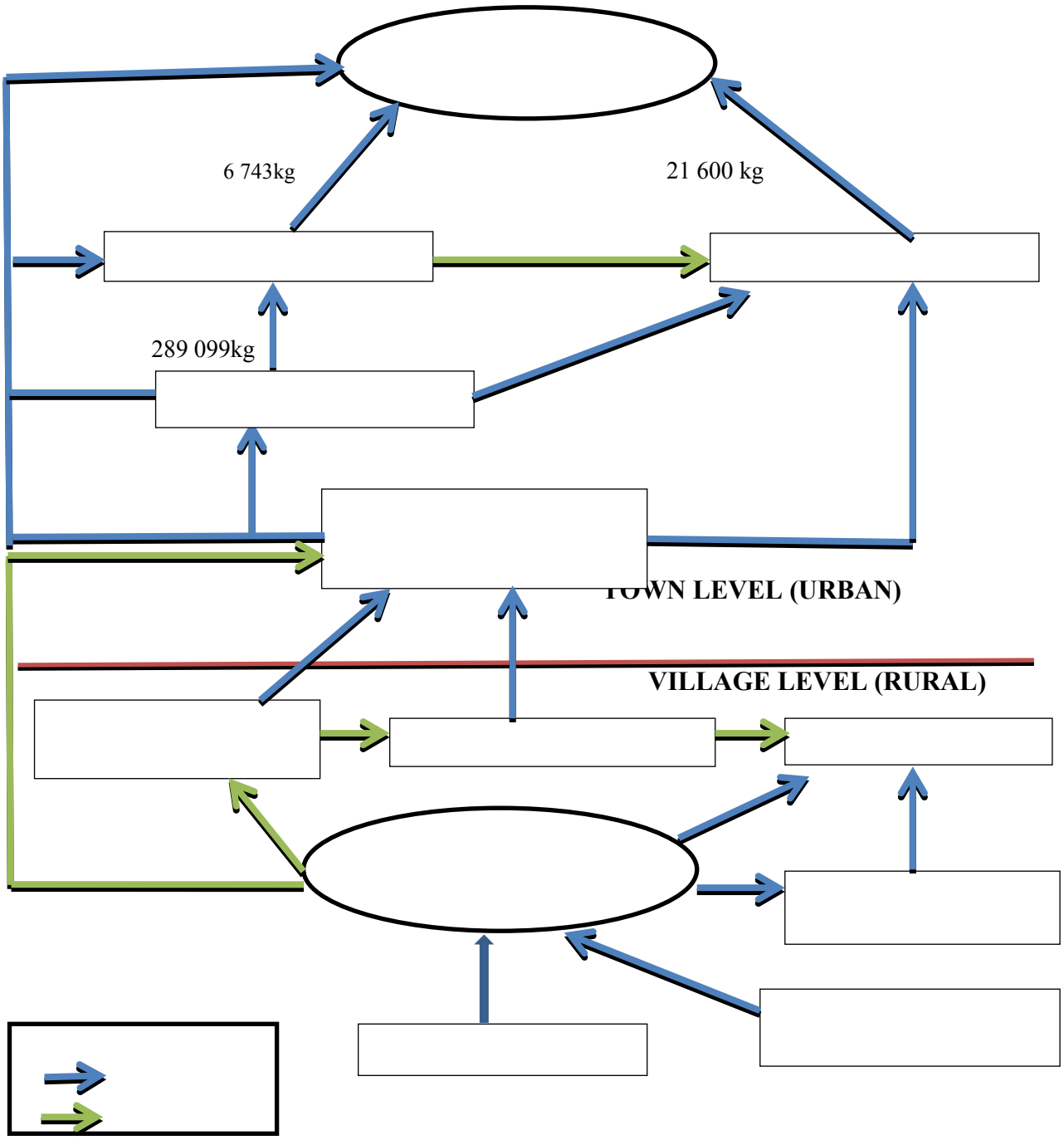

Figure 3: Irish potato value chain map in Njombe urban and Wanging'ombe districts

4.3.2 Actors in Irish potato value chain

Different actors exist in the Irish potato value chain in Njombe urban and Wanging'ombe districts. The major actors in the Irish potato chain in the study areas are producers (farmers), middlemen (village agents), traders (wholesalers and retailers), processors, service providers and individual consumers (final consumers). However, village agents reported to be the major means of market information to farmers they were acting like a bridge. The characteristics of each of the actors are as follows:

4.3.2.1 Producers

Irish potato is mainly produced by smallholder farmers in Njombe urban and Wanging'ombe districts. The average area under production per household in Njombe urban and Wanging'ombe districts were about 2 and 1 acre respectively. The average production of Irish potato for most of farmers in Njombe urban and Wanging'ombe district were 8960 and 3322kg/acre.

Several varieties of Irish potatoes are cultivated in Njombe urban and Wanging'ombe districts; these include Kidinya (CIP), Kala, Arika, loti, Obama and Baraka. CIP-red was introduced early 1990 and it is mainly under rain fed, Arika and Loti were introduced early 1980 to 1990. Kala and Obama varieties were normally cultivated under irrigation agriculture in Iwungilo and Ngalanga villages in Njombe urban.

The findings show that in Njombe urban district the cost of potato seed accounts for 24% of the total costs of production while in Wanging'ombe district the cost of fertilizer accounts for 24% of the total costs of production (Table 6).

Table 7: Irish potato production cost per acre per year

Cost in Tshs	Njombe urban district cost/acre (Tshs)	Proportion of TVC (%)	Wanging'ombe district cost/acre (Tshs)	Proportion of TVC (%)
Labour				
Land preparation	147 296.9	11.6	26 984.8	7.2
Planting	47 476.6	3.7	27 651.5	7.4
Weeding	71 664.1	5.6	47 636.4	12.8
Fertilizer application (Tshs. 10 000/acre)	10 000.0	0.8	10 000.0	2.7
Harvesting (Tshs. 3000/bag)	200 726.6	15.8	48 931.8	13.1
Transporting (Tshs. 2000/trip)	130 453.1	10.2	11 909.1	3.2
Inputs				
Potato seed (Tshs. 30000/bag)	309 794.8	24.3	16 757.6	4.5
Fertilizer (DAP,UREA,CAN)	213 218.8	16.7	89 227.3	23.9
Irrigation (pipes)	85 390.6	6.7	0	0
Pesticides (sumithion, dursban, thionex)	57 867.2	4.5	47 531.8	12.8
Renting land	160 273.4	12.6	46 287.9	12.4
Total Variable Cost (TVC)	**1 273 889**	**100**	**372 918.2**	**100**

In Njombe urban the cost of production per acre was very high compared to Wanging'ombe district because in Njombe urban district majority of people depends on irrigation while farmers in Wanging'ombe district depends on rain fed. The costs of production include land rent, land preparation, planting, weeding, fertilizing, harvesting,

irrigation, seed cost and pesticides. Moreover, in Njombe and Wanging'ombe districts 53% of the farmers were renting land (Table 7).

Table 8: Percent of farmers renting land

Criteria	Frequency	Percent (%)
No	60	46
Yes	70	54
Total	**130**	**100**

4.3.2.2 Village traders (agents)

Most farmers sell their produce to agents in Njombe town (urban area) through local agents in the rural areas (village traders). Village traders act as a bridge because they buy Irish potato directly from farmers but they are not selling Irish potato to traders or agents in urban area they are just connecting farmers and traders in urban.

4.3.2.3 Traders (retailers and wholesalers)

In Njombe urban and Wanging'ombe districts, traders (wholesalers and retailers) transport Irish potato from farms in rural areas to urban centers such as Njombe town, Makambako town, Morogoro region and Dar es Salaam. The main function of these retailers is to buy and sell the produce to local processors and consumers. However, the price varies from one place to another depending on the distance from the farmers to the market.

4.3.2.4 Processing (local processors)

In Njombe region there were four types of processors; those who were only peeling Irish potato and selling the peeled Irish potato in hotels, those who made crisps, those who made crisps, and the last one are those who fried Irish potato (chips), the most common

processed product is crisps, fried/roasted Irish potato. There were only 5 processors in Njombe town who were processing crisps the rest were found in Makambako town, Most of the processors mentioned that they need more processing method such as making Irish potato powder.

4.3.2.5 Consumers

These are the final actors in the value chain. These individual consumers buy Irish potato in different forms such as boiled Irish potato, fried, crisps and raw. Fried Irish potato was the most popular form of product consumed in Njombe region. The study revealed that consumer decision to purchase Irish potato and its produce, were subject to quality by 62%, however the hygiene item were not a main factor for consumers (Table 8).

Table 9: Factors in the decision to purchase Irish potato

Factors	Frequency	Percent (%)
Quality	13	62
Size	3	14
Hygiene	1	5
Variety	4	19
Total	**21**	**100**

4.3.2.6 Support services

Support services in Irish potato value chain include input supply, extension services, and financial services. Currently, In Njombe urban and Wanging'ombe districts most of the farmers used their own seed which they stored in the soil. Kidinya (CIP) variety was obtained from Uyole Agricultural research Institute (ARI) in Mbeya. Few of the farmers have access to financial services like SACCOS and Njombe Community Bank (NJUCOBA).

4.3.3 Irish potato value addition at trader's level

An assessment was made on the value addition processes such as storage, transport, and processing, as carried out by Irish potato traders. The findings show that some of Irish potato traders in Njombe undertake value addition processes at their trading sites.

In Njombe majority (65%) of the traders were not storing Irish potato this could be because Irish potatoes are perishable, and farmers lack the necessary storage technology. Approximately 58% of traders were involved in transportation only (without storage) while only 32 % were involved in both transportation and storage (Table 9).

Table 10: Irish potato value addition processes done by traders

Value addition	Frequency	Percent
Storage		
No	20	65
Yes	11	35
Total	**31**	**100**
Transportation		
No	13	42
Yes	18	58
Total	**31**	**100**
Storage and Transportation		
No	21	68
Yes	10	32
Total	**31**	**100**

4.3.3.1 Storage technique of Irish potato at trader's level

In this study, traders were asked whether they stored Irish potato before selling (Table 9). The findings show that the majority of Irish potato traders in Njombe (45%) store Irish

potato on the ground under shades to maintain the appropriate moisture content (Table 10). Traders reported problems encountered when storing the products which included quality loss caused by poor storage technique which reduces moisture content.

Table 11: Storage technique of Irish Potato at trader's level

Storage technique	Frequency	Percent
Not applicable	12	39
Local on shade	14	45
Local technique in nylon bags	5	16
Total	**31**	**100**

4.3.3.2 Mode of transport used by Irish potato traders

In Njombe the common mode of transporting Irish potato among traders were truck/pick-up, bicycles, motorcycle and public transport, while the majority of traders (36%) were using truck to transport Irish potato from Wanging'ombe and Njombe Urban districts (Table 11).

Table 12: Transport mode used by traders

Transport mode	Frequency	Percent
By head	4	12
Bicycle	6	19
Public transport	2	7
Truck/pick-up	11	36
Motorcycle	5	16
Not applicable	3	10
Total	**31**	**100**

4.3.4 Value addition at processors' level

An assessment was made on the value addition processes at processors' level that are, peeling, crisping, packaging and frying. The findings show that some of Irish potato processors in Njombe Town and Makambako undertake value addition processes at their sites (Table 12). In Njombe majority of the processors peel Irish potato (55%) and sell it to hotels and other processors who make crisps.

Table 13: Value addition at processors level

Value addition	Frequency	Percent
Peeling	11	55
Crisping and packaging	8	40
Frying	1	5
Total	**20**	**100**

- **Storage technique of Irish potato at processors level**

In this study, processors were asked whether they stored Irish potato before selling. The findings show that the majority (55%) of Irish potato processors in Njombe Town and Makambako use crisping, frying, packaging and sealing mechanism as a storage technique, while 45% of Irish potato processors wash and preserve in cold water (Table 13).

Table 14: Storage technique used by processors

Storage technique	Frequency	Percent
Crisping, frying, salt, pepper, Packaging and sealing	11	55
Wash and preserve in cold water	9	45
Total	**20**	**100**

4.4 Irish Potato Marketing Channels

Irish potato marketing channels in Njombe urban and Wanging'ombe districts are characterized by a few number of small scale traders operating individually. The market actors in the Irish potato marketing channels were producers, local retailer (rural agents), traders (retailers and wholesalers), local processors and consumers. The most important channels (routes) involved in the transfer of Irish potato produce and Irish potato products in the study area are listed below (Fig. 4). A significant amount of Irish potato was channeled through the second channel.

Channel - I: Producers → consumers

Channel - II: Producers → local agents → Traders → consumers

Channel - III: Producers → local agents →Processors → consumers

Channel - IV: Producers → local processors → consumers

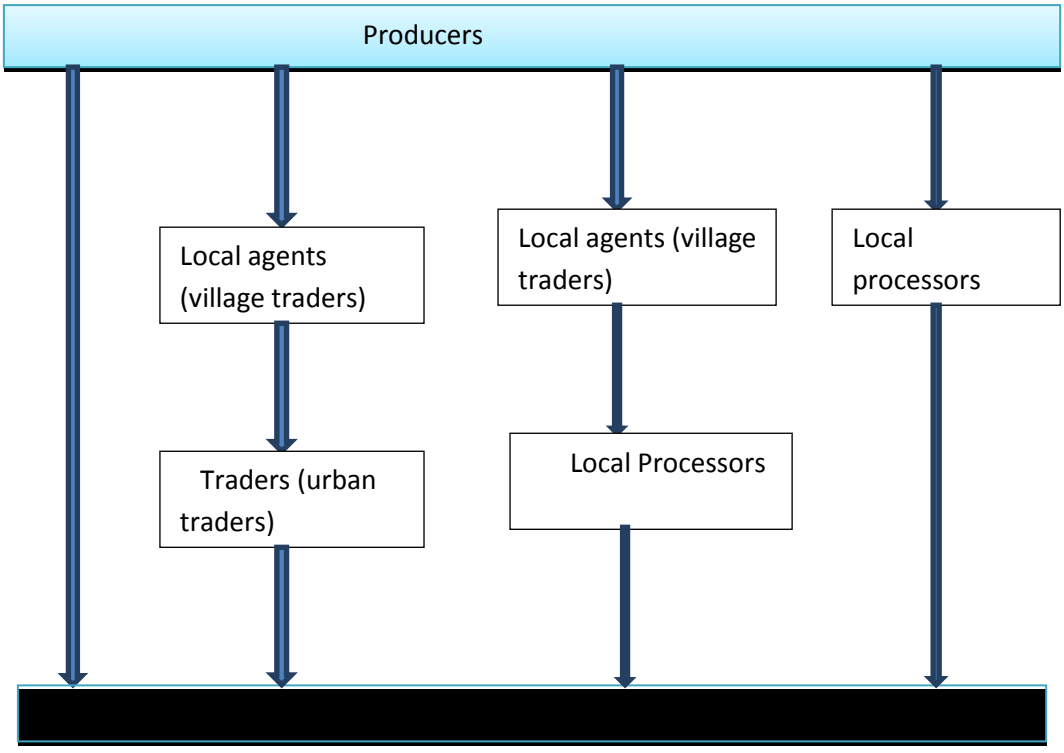

Figure 4: Irish potato marketing channels in Njombe

4.5 Price Determination

Quaye *et al.* (2004) argued that prices received by any actors are most important elements in the marketing system. Any improvements of marketing infrastructure will be ineffective if the price generated within the system is ineffective. Price determination at the farmers, traders and processors levels are presented below (Table 15). The findings showed that at farmer's level, 44% of farmers mentioned that price is determined by buyers. Analysis shows that farmers are forced to comply with the proposed price by the buyer because they have low bargaining power and poor information of the price at the market. Gebremedhin *et al*. (2007) affirmed that little or no access to market information resulted into information asymmetry where the traders have more information than the producers which is a market imperfection thereby frustrating negotiations between the sellers and traders. The availability of market information boosts confidence of farmers who are willing to market their produce. In other words, market information allows farmers to take informed decisions (Jari, 2009).

At processors level and trader's level 85% and 65% of the respondent mentioned that sellers have decision on selling price**.** However, on the other hand the decision by both buyer and seller (negotiation) was not significant as it was only reported to be 5% for processors (Table 15).

Table 15: Mode of price determination

Mode	Frequency	Percent
Farmers		
Buyers	58	44
Sellers	46	35
Both (negotiation)	26	20
Total	**130**	**100**
Processors		
Buyers	2	10
Sellers	17	85
Both (negotiation)	1	5
Total	**20**	**100**
Traders		
Buyers	4	13
Sellers	20	65
Both (negotiation)	7	22
Total	**31**	**100**

- **Factors considered by producers, traders and processors in setting selling price**

Farmers have their own criteria in setting prices for their produces (Table 16). In Njombe urban and Wanging'ombe districts, the study found that criteria for setting price for farmers, traders and processors were moisture content, demand forces, size of the Irish potato and quantity. Results revealed that in Njombe urban and Wanging'ombe districts, producers chose moisture content as the first choice, quantity as the second choice, demand forces as the third choice and size of Irish potato as the fourth choice (Table 16). At trading and processing level majority of respondent considered moisture content as the first choice in setting selling price, quantity as the second choice for traders while for

processors the second choice was size of the Irish potato, demand forces was the third choice for trades while for processors it was the fourth choice (Table 16).

Table 16: Factors considered in setting selling price

Factors	Percent (%)	Rank
Producers		
Demand forces	43.8	3
Moisture content	71.5	1
Quantity	47.3	2
Size	20.8	4
Traders		
Demand forces	35.5	3
Moisture content	64.5	1
Quantity	54.8	2
Size	29.0	4
Processors		
Demand forces	42.1	4
Moisture content	75	1
Quantity	65	3
Size	70	2

4.6 Gross Margin Analysis of Irish Potato

4.6.1 Gross margin analysis of Irish potato for farmers

The results shows that in Njombe urban and Wanging'ombe districts farmers received the lowest gross margin compared to all actors involved in the chain. In Njombe urban district farmers earn the gross margin of about Tshs. 563 496 per acre which is equal 0.30% of the value of sales on average and Tshs. 51 per kg which is equal to 0.25% of value of sales on average, while in Wanging'ombe distict they earn the gross margin of Tshs. 239 262 per

acre (0.40%) and Tshs. 22 per kg per year which is equal to 0.12% of value of sales on average. This is due to low price that farmers received in selling Irish potato. On average, farmers in Njombe urban and Wanging'ombe districts sold 1 kg of Irish potato to traders for Tshs. 207 and 182 which are less compared to the market prices of Tshs. 451 per 1kg when directly sold to the market. The difference of gross margin between these two districts is that; in Njombe urban farmers depend on irrigation so most of the time they harvest Irish potato the time of scarcity whereby their selling price is higher than in Wangong'ombe district who depends on rain fed. Farmers in Njombe urban and Wangin'gombe districts incurred high cost of production per kg (Tshs. 156 and 160) and sold at very low prices, mainly because they sold at farm gate and lacked market information and farmers lacked storage facilities, which they could store and sell their produce during scarcity when prices were high, and hence were forced to dispose their produce at low prices to avoid damage. Those farmers who stored their produce in the soil could not do so for long periods, as the land had to be used for other purposes (Table. 17).

Table 17: Gross margin analysis for farmers in Njombe urban and Wanging'ombe districts

Gross margin	Njombe urban (average cost) Tshs/acre	Tshs/kg	Wanging'ombe (average cost) Tshs/acre	Tshs/ kg
a) Cost				
Labour				
land preparation	147 296.9	17.5	26 984.8	13.5
Planting	47 476.6	5.9	27 651.5	16.9
Weeding	71 664.1	8.8	42 500	17.9
Fertilizer application	7125	0.8	6000	1.8
Harvesting (Tshs.3000/bag)	200 726.6	14.3	48 931.8	18.1
Transporting (Tshs. 200/trip)	130 453.1	12.6	11 909.1	6.8
Inputs				
Potato seed (Tshs. 30000/bag)	309 794.8	29.6	16 757.6	6.4
Fertilizer	213 218.8	31.4	89 227.3	35.8
Pesticides	57 867.2	8.2	47 531.8	27.6
Renting land	160 273.4	19.9	46 287.9	15.2
Irrigation pipes	85 390.6	6.7	0.0	0
Storage (nylon bags)	4101.6	0.5	0.0	0
Total variable cost (A)	1 288 092	156.2	363 781.8	159.9
b) Revenue				
Selling price (B)	1 851 759	207	60 3043	182
Gross Margin (B-A)	563 667	50.8	239 262	22.04
Gross Margin ratio (B-A)/B	0.30%	0.25%	0.40%	0.12%

4.6.2 Gross margin analysis of Irish potato for traders

Traders in Njombe receive the gross margin of Tshs. 422 per kg while the average cost incurred in all trading activities was Tshs. 30 per kg, In terms of percentage; the gross margins were 93% of the value of sales for Irish potato traders (Table 18). This may be associated with low price they offer to farmers and low cost they incur in the process of transportation. The results show that trader's gross margin is high compared to farmer's, which could prove that traders exploited farmers.

Table 18: Gross margin analysis for traders

Gross margin	Total cost/year	Total cost/kg
a) Cost		
Labour cost (loading & unloading)	175 629	3.6
Transportation cost	129 279	4.7
Security cost	18 200	3.4
Marketing charges	49 896	5.2
Local government tax	44 250	4.1
Business license	39 900	8.0
Storage cost (nylon bags)	9 450	0.5
Total variable cost (A)	466 604	29.5
b) Revenue		
Average selling price (B)		451
Gross Margin (GM)(B-A)		421.5
Gross margin ratio (B-A)/B		0.93%

4.6.3 Gross margin analysis of Irish potato for processors

The results show that in Njombe, processors earn the highest gross margins compared to the other actors in the chain. Processors earn a gross margin of Tshs. 2939 per kg per year which is equal to 98% of sales on average for Irish potato processors (Table 19).

The high gross margin could be attributed to the use of cheap processing technologies and tools such as knives, hence incurred low production cost. They were also able to sell at very high prices, possibly because they were few and lacked competition.

Table 19: Gross margin analysis for processors

Gross margin	Quantity	Total cost/year	Total cost /kg
a) Cost			
Transportation cost	31 100 kg	78 000	27.12
Storage cost	20 300 kg	12 250	0.78
Preservation cost	15 040 kg	4 750	1.13
Security tax	Tshs.660/month	8 000	3.81
Other cost		39 230	24.02
Total variable cost (A)		142 230	56.86
b) Revenue			
Selling price (B)			2996
Gross margin (B-A)			2939.14
Gross margin ratio (B-A)/B			0.98%

4.7 Role of Rural-urban Connection

The results obtained from focus group discussion indicate presence of flows of people, ideas, capital, goods and services between rural villages and urban centers. Therefore the exchange of goods between urban and rural areas is an essential element of rural-urban linkages.

People migration started back in 1992, most of people migrated from Iwungilo village to Songea and Dodoma for agricultural activities, and Dar es Salaam for business. Migration has however slowed down due to increase in farming activities especially Irish potato and availability of social amenities such as schools. People are able to work as a family and

hired labour in their villages, instead of migrating. In Iwungilo village there was a flow of ideas, inputs such as fertilizer, seeds from Uyole research institute in Mbeya, irrigation pipes from Njombe town to Iwungilo, and labour from Wanging'ombe district to Njombe urban district (Iwungilo village). An example of transfer of ideas is introduction of irrigation agriculture by immigrants from Njombe town. Increase in migrant labour started in 2007 due to increase in Irish potato production, especially after introduction of irrigation. There was also flow of financial services in the form of credit from Igoma SACCOS which is near their village and NJUCOBA which is located in Njombe town. There were flows of output (Irish potato produce and product) from Iwungilo village to Njombe town, Dar es Salaam, Morogoro region and Makambako. After harvesting most of the farmers go to Njombe town for shopping, and buying donkeys used for transportation purposes from Mbalali in Songea district (Fig. 5).

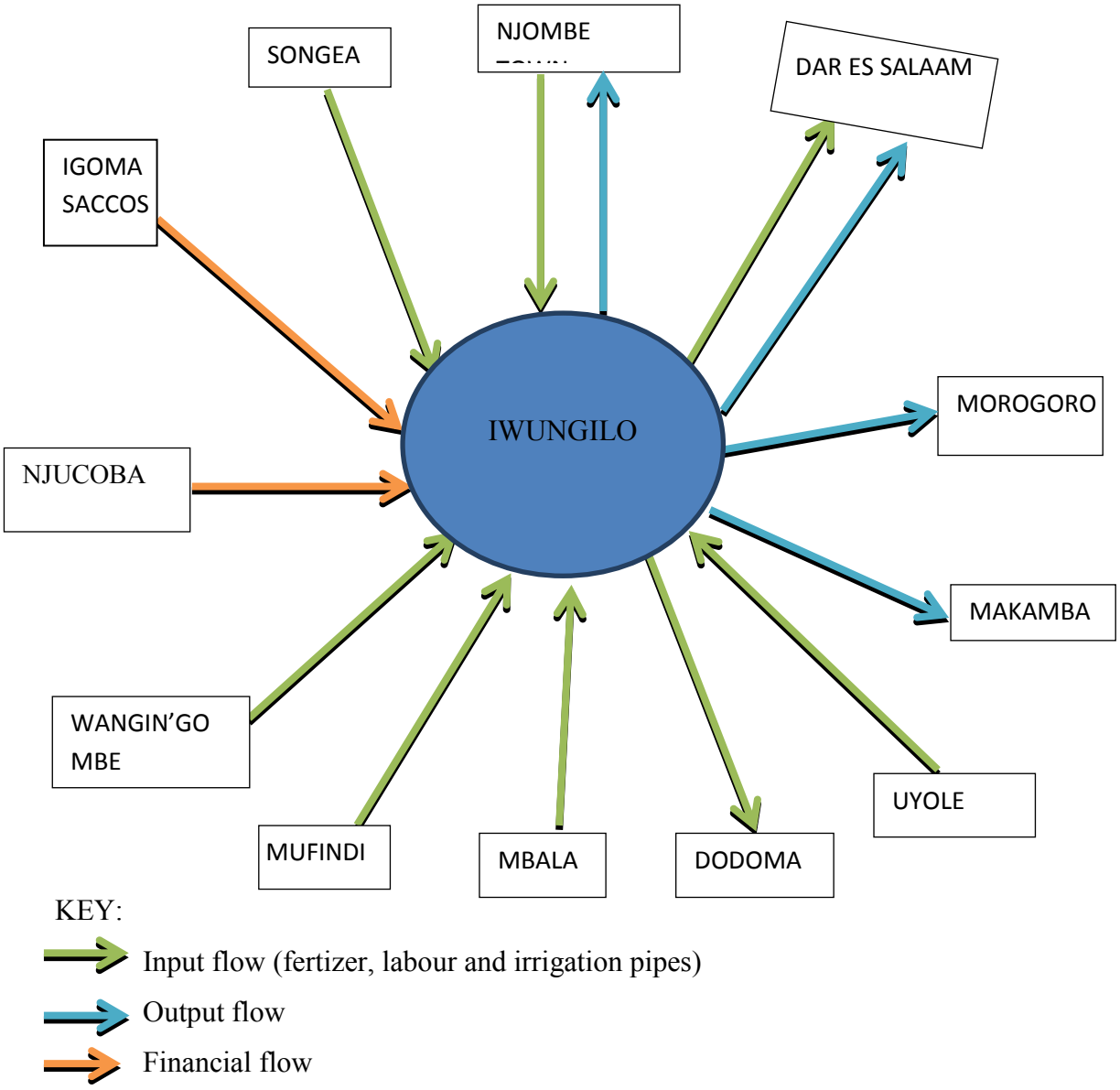

Figure 5: Rural-Urban linkages in Iwungilo Village

In Ngalanga village most of people migrate to Songea, Dodoma, Dar es Salaam and Njombe town in 2000. In early 2012 however, there was an increase in the number of people from Makambako, Iringa and Songea to Ngalanga village for agricultural activities, mainly to provide labor or in search of land for Irish potato production. There were flows of fertilizer from Njombe urban to Ngalanga village and output flow from Ngalanga to Njombe town, Makambako, Iringa, Morogoro and Dar es salaam. Most of farmers in

Ngalanga village received financial services like loans from the nearby SACCOS called Igoma SACCOS (Fig. 6).

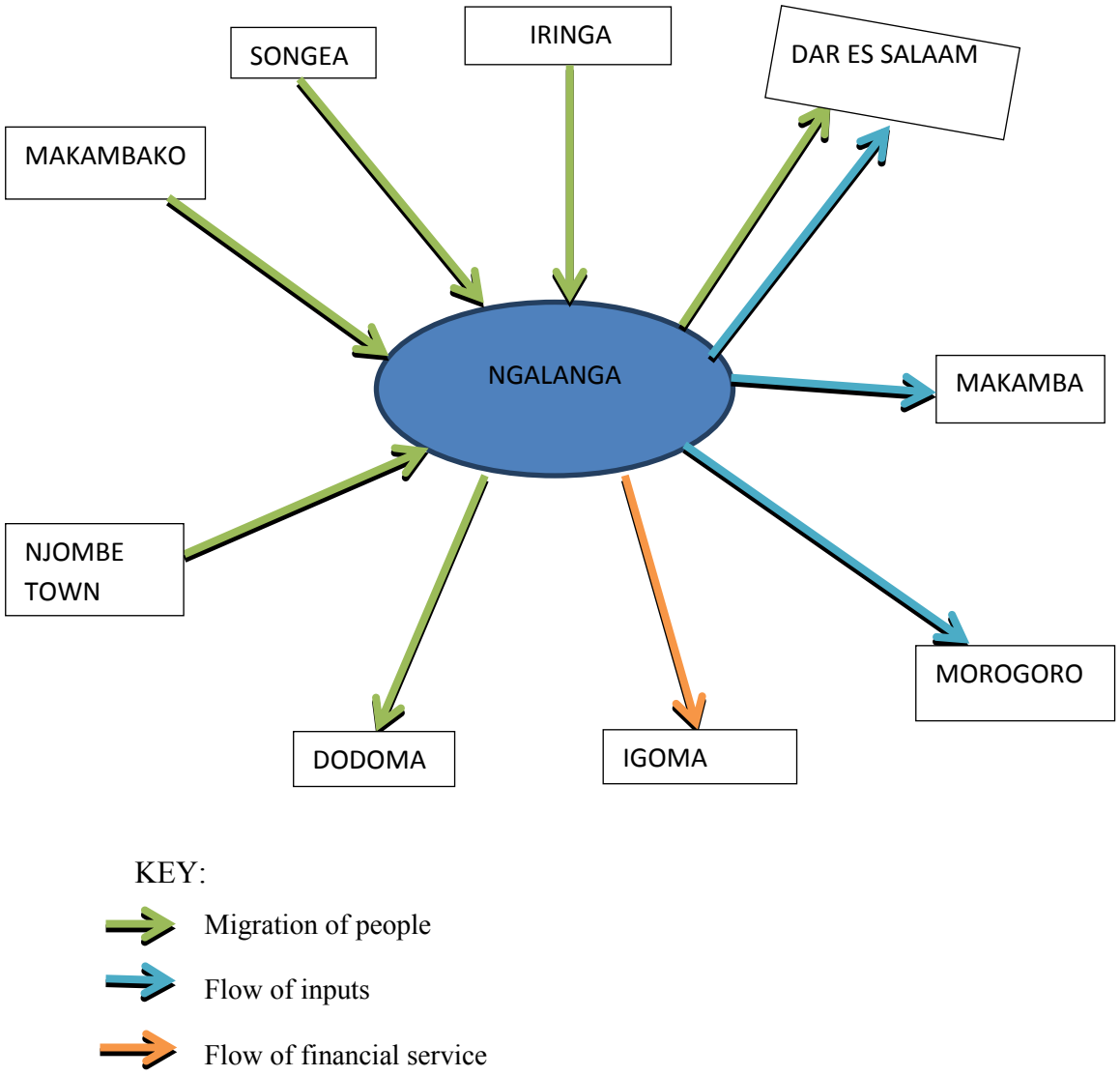

Figure 6: Migration and mobility in Ngalanga Village

From 2000 most of people in Igagala and Ulembwe started migrating to Dar Es Salaam for business and Songea for agricultural activities. Others moved to Itipula/ihanga-kifanya in Njombe to grow pine trees and do business. A few of them have permanently migrated from Njombe to songea while others come back to Igagala village on September to December for harvesting of maize and wheat. Others have permanently migrated to Tunduma, Lindi and Masasi for business purposes (Fig. 7).

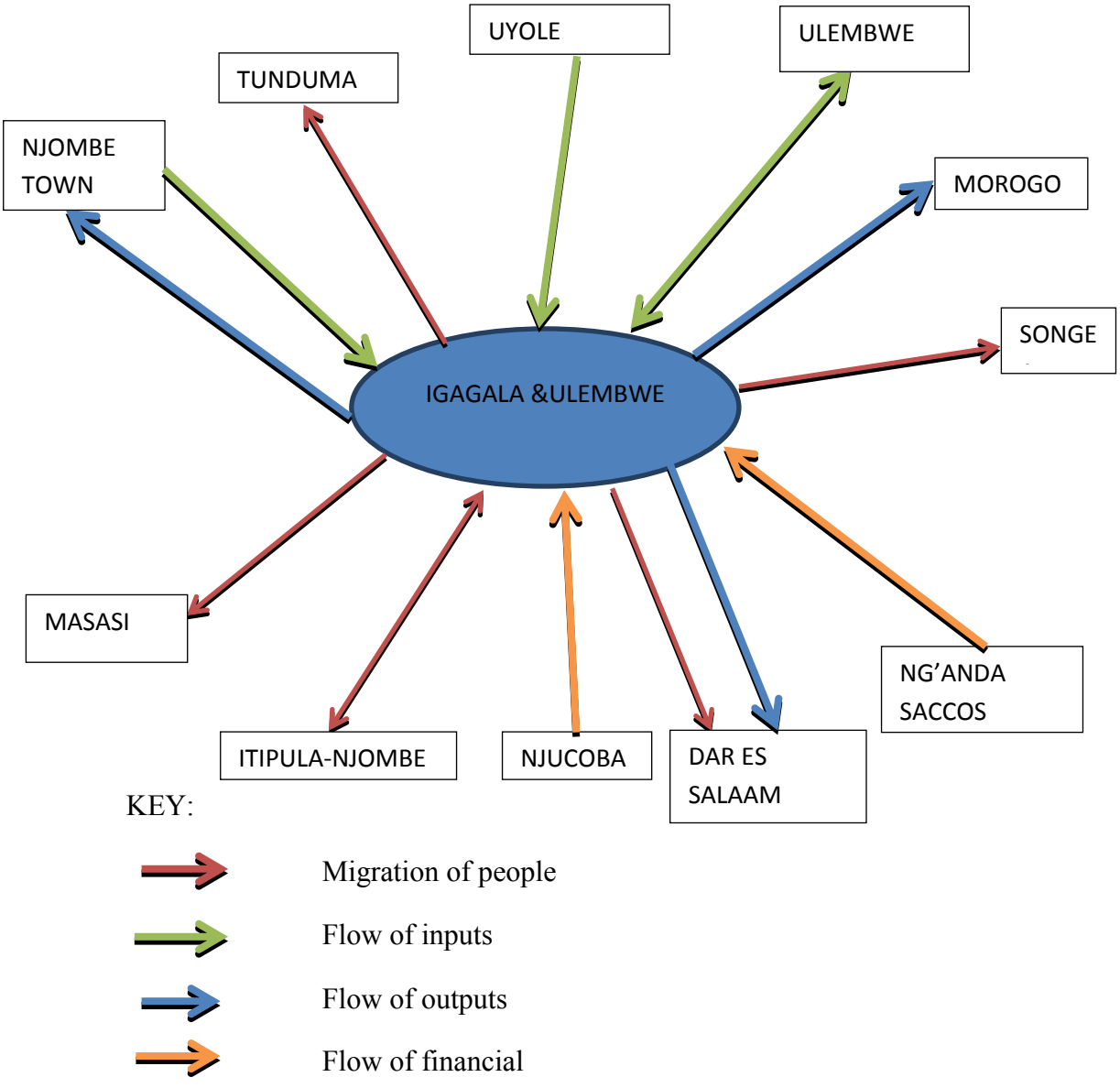

Figure 7: Migration and mobility in Igagala and Ulembwe villages

Few of the farmers went to Ng'anda SACCOs for loans and Ulembwe village to provide casual labour in Igagala village. There are flows of fertilizer from Njombe town to Igagala and Ulembwe villages, and seeds like Kikondo/CIP from Uyole Research Institute in Mbeya Region. In Igagala and Ulembwe villages farmers sold their produce to Njombe town wholesalers who also sell their produce to Dar es Salaam and Morogoro Region. From the focus group discussion, it was discovered that households who had members outside their region had high chance to receive information, ideas and remittances.

4.8 Reliability of the Model

The reliability of the regression model may be undermined by a violation of the assumptions underlying ordinary least square (OLS) regression analysis. Any violation of the assumptions would cause the model to be un-reliable. In this study the expected regression problems were heteroscedasticity and multicollinearity as cross sectional data were used. Heteroscedasticity indicates the uneven distribution of the error term while multicollinearity describes a situation of which one or more independent variables are highly correlated. The rule of thumb for multicollinearity is a Variance Inflation factor (VIF) of 5 or greater, or if the condition number (CN) is greater than 20 indicates severe multicollinearity (Madalla, 2000). White test was used to test heteroscedasticity. But the data for this study were free from the mentioned problems; further results are presented in Appendix 5 and 6. Continuous variables such as age and income were tested for normality of distribution and the necessary transformations carried out.

- **Determinant of Irish potato profitability at farm level**

Findings from regression analysis show that only 34% of the variation in Irish potato gross margin at farm level is due to the independent variables included in the regression model (Table. 20).

Table 20: Determinant of Irish potato profitability at farm level

Variables	Coefficients	Std Error	Probability
Constant	-186.78	49.10	0.000
Gender	54.62	28.96	0.062*
Primary education	23.62	33.53	0.483
Secondary education	58.44	60.46	0.336
Farmer's group	4.20	34.97	0.905
Loan	23.77	32.21	0.462
Age	907.12	740.63	0.098*
Farm size	32.89	32.89	0.035**
Income	0.06	0.03	0.018**
Farm location	-1.54	0.80	0.055*
Irrigation (Dummy)	32.22	16.27	0.050**
R-squared	0.34		
Adj R-squared	0.28		

(***) (**) (*) significant at 1, 5 and 10 percent level respectively

The findings show that gender of household head in Irish production was statistically significant and positive at 10 % (Table 20). This implies that holding other factors constant being a male farmer increased the gross margin by about Tshs. 55 per kg. Female led households are more likely to be poor as compared to male headed ones (Kiriti and Tisdell, 2003); this means that female farmers are financially constrained in accessing production factors such as land, fertilizers, seeds, and pesticides. Ultimately, this leads to low production and productivity, hence lower gross margin.

Moreover, farm size was also statistically significant at 5 % and positively related to Irish potato gross margin (Table 20). A unit increase in the size of the farm in acre increased the household gross margin by about Tshs. 33 per kg. This suggests that farmers with large farm size have higher chances of earning larger gross margin than those with small farms.

This is because large scale farmers incur less production costs probably as a result of economies of scale.

The findings also show that annual income received by the household was significant at 5% and positively related to gross margin. Holding other factors constant an increase in one unit of income increased the gross margin of farmer by Tshs. 0.1 per kg. Farmers with high income are able to purchase farm inputs, thus obtained higher yields and were able to market away from farm gate where prices were higher.

Farm location was significant at 10% and negatively related to gross margin. A unit increase in the distance (km) of Irish potato plot from the main market decreased gross margin by Tshs. 1.5 per kg. This implies that farmers with Irish potato plots near to main market have higher chances of getting larger gross margin than those with Irish potato plot far from the main market. This is because the farmers whose plots were near main markets received higher prices resulting from lower transport and probably transaction cost to the market.

Moreover age was statistically significant at 10% and positively related to Gross margin. Age was used as a proxy for experience and manpower; results showed that if the age of the household doubled the gross margin decreased by Tshs. 907 per kg because of decrease in manpower. To determine whether the increase was indefinite, age square was used, the results were significant and negative, hence at some point, the gross margin would begin to drop, probably because of decreased manpower.

The findings also show that irrigation was also statistically significant at 5% and positively related to the Irish potato gross margin. The mean gross margin of land under irrigation is

higher by Tshs. 32 per kg. This implies that farmers who irrigated their land had higher chances of getting larger gross margin than those who are under rain fed.

4.9 Major Challenges Facing Farmers

Based on the results in Njombe and Wanging'ombe districts, majority of the farmers (32%) mentioned that low prices was the main constraint they faced. Farmers lacked capacity to transport the produce to market where prices were high. In Addition, all of the Irish potato farmers in Njombe were not members of farmers group, hence had no bargaining power (Table 21).

Table 21: Farmers challenges

Challenges	Frequency	Percent
Open market prices are too low	41	32
Lack of market information	26	20
Transport cost are too high	13	10
Market are too far	33	25
Farmers association problem	17	13
Total	**130**	**100**

4.10 Major Challenges Facing Traders

The researcher assessed the challenges faced by Irish potato traders in Njombe Urban and Wanging'ombe districts (Table 22). The findings show that the major trading challenge mentioned by traders in the two districts was lack of credit (45%). Other challenges were lack of trader organization, poor infrastructure which increases the cost of transportation and poor storage technique.

Table 22: Traders challenges

Challenges	Frequency	Percent
Lack of credit	14	45
Lack of traders organization	6	19
Poor infrastructure	6	19
Poor storage technique	5	16
Total	**31**	**100**

4.11 Major Challenges Facing Processors

Results revieled that in Njombe and Wanging'ombe districts, majority of the processors (50%) mentioned that the major challenge they faced was lack of training on how to process various product such as Irish potato powder, packaging and branding that would increase comptition among themselves. Other challenges were lack of credit and poor storage technique (Table 23).

Table 23: Challenges facing processors

Challenges	Frequency	Percent
Lack of credit	6	30
Lack of training	10	50
Poor storage technique	4	20
Total	**20**	**100**

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study aimed to assess Irish potato gross margin of various actors along the chain and to determine the role of rural and urban linkages in the study area. Specifically, the study mapped Irish potato value chains in Njombe Urban and Wanging'ombe districts. The study also determined gross margin obtained by different actors involved in the Irish potato chain; identified the role of rural and urban linkages within the study area; and analyzed factors influencing Irish potato farmers' gross margin. The targeted actors were producers (farmers), processors, traders (wholesalers and retailers), and consumers of Irish potato in Njombe Urban and Wanging'ombe districts in Njombe Region.

From the first objective which was to map the Irish potato value chain in Njombe urban and Wanging'ombe districts, the findings revealed a number of participants (actors) such as input suppliers, small-scale farmers, retailers/transporters (rural and urban retailers), local processors and final consumers of raw and processed Irish potato. This shows high intensity of value addition and complex interactions among actors and chain service providers in Njombe Region.

The second objective was to determine gross margin of Irish potato among actors involved in the value chain. The study results show that in Njombe Urban and Wanging'ombe districts, farmers received the lowest gross margin compared to other actors involved in the chain. This is due to high cost of production incurred by farmers, and low prices they received on selling the produce. In Njombe Urban and Wangong'ombe districts farmers received the gross margin of Tshs. 51 per kg which is equal to 25% of sales on average

and Tshs. 22.4 per Kg which is equal to 12% of sales on average. The high cost of production incurred by farmers emanates from high cost of inputs such as pesticides and fertilizers which are heavily used in Irish potato production. Low farm gate prices were attributed to long distances to the market and poor infrastructure, among other reasons. Processors earned the highest gross margin compared to other actors involved in the chain; they received the gross margin of Tshs. 2939 per kg which is equal to 98% of sales on average, which could be attributed to value addition and the low cost of doing so.

Results from focus group discussions show that in Njombe Urban and Wanging'ombe districts there were flow of people, ideas, and inputs such as, fertilizer, seeds, irrigation pipes, financial serves like loan, as well as flow of output. Infrastructure is the main driver of rural and urban linkage. In addition, the findings show that Gross margin of farmer was influenced by gender, farm size, age, irrigation, farm location as well income.

5.2 Recommendations

Based on the findings of the study the following recommendations are suggested for the improvement of sustainable Irish potato value chains in Njombe Urban and Wanging'ombe districts. For the improvement of Irish potato value chains in Njombe and Wanging'ombe districts, the study recommends that the government should come up with policies aimed at subsidizing the cost of farm inputs such as fertilizer and pesticides so as to lower the cost of production.

In addition, programs aimed at advancing improved seed varieties and modern farming equipment/tools should be supported so as to improve productivity and yields, which would in turn bolster gross margins at farm level. Further, policies aimed at lowering market transaction costs, by providing market information, building market sheds near

farms/villages, and formation of farmer organizations/associations will enable farmers participate and benefit from Irish potato value chains. The government should strengthen transportation infrastructure, this would ensure higher farm gate prices and facilitate the dissemination of market information for the benefit of the farming community.

The study recommends that the government should initiate interventions aimed at providing credit and/or storage facilities to traders and processors. This will assist them to increase the volume of handling through organized retail chain to make the business more commercialized and benefit from economies of scale. This increased volume of trading will benefit both consumers and producers and attract other farmers to diversify their cropping system, thereby increasing the area under Irish potato cultivation.

Provision of training opportunities on value addition to processors will enable them to diversify to other products such as Irish potato powder, which will ensure competition, sustainability and growth. In addition, processors should use improved tools for processing their product to increase efficiency and productivity.

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APPENDICES

Appendix 1: Producer survey questionnaire

Economic analysis of Irish potato value chain in Njombe urban and Wanging'ombe district, Tanzania

Country			
Region/ Province			
Division/Sector			
Ward/Cell			
Village			
if possible: GPS latitude, longitude and altitude	**Longitude:**	**Latitude:**	**Altitude:**

Date (DD/MM/YY)	
Name Interviewer	
Full name Respondent	
Household Code	

Since when (year) has the household been resident in this house?	

HOUSEHOLD DATA

This study uses the concept of "stretched household": those who live in the house/compound + those members who live elsewhere but contribute to the household's livelihood.

A-1: General data for the household

HH Member ID	**Name (in full)**	**Resident?**	**Relation to HH head**	**Gender**	**Age**	**Birthplace**	**Previous place of residence (before current one)**	**Ethnicity**	**Highest level of education completed**	**Main activity**
		1. Resident 2. Usually absent	1. head 2. spouse 3. child 4.father/mother 5.brother/sister 6. grandparent 7. grandchild 8. other family: specify___ 9. other non-family: specify___	1.Male 2.Female		Specify location (district and village)	Specify location (district and village)	If applicable		1. Income generating 2. school 3. unemployed 4. retired 5. disabled 6. Subsistence production 7. domestic work 8. other (specify___)
1										
2										
3										
4										
5										

Does Head of household have other wives who are living elsewhere?		**If yes: How many?**		**How many children do they have?**	

For those HH members who are mostly or permanently away ("usually absent"code 2 from previous question)

HH member ID	**Reason for leaving** 1. Education 2. Work 3. Other Specify all	**Current location** 1. Nearby village 2. Village in same district 3. Town/ city 4. Abroad Specify the name of the place (District, town, village...)	**Duration since leaving** Years and months	**How many times do they visit this household?**	**For what reason do they visit this household?**

A-3: Information on economic activities of the resident household members

HH member ID	**Main income generating activity (occupation)**	**Additional economic activities**	**Labour position**	**Place of non-agricultural employment (geographical)**			**Employer**
	Specify__	Specify__	1. Self-employed 2. Employer 3. Permanent wage labour 4. Long term contract (one year and above) 5. Short term contract (less than one year) 6. casual wage labour 7. Family workers without pay	Specify the name of the place and distance in time and/or km			If applicable
				Name of place	time	km	
1							
2							
3							

MIGRATION AND MOBILITY OF ECONOMICALLY ACTIVE RESIDENT HOUSEHOLD MEMBERS

ID	Describe the main destination of <u>work-related</u> shorter periods of migration (less than 3 months)	Frequency of trips away from your home location	Most used means of transport	Main purpose of these trips (specify)	% of the time spent in rural and urban locations (over past 12 months)	
	District name, settlement name, rural (r) or urban (u)	1. daily commuting 2. every week 3. every month 4. a few times a year 5. seasonal 6. occasionally	1. bus 2. car 3. truck 4. motorbike 5. bicycle 6. other (specify___)		Rural	Urban
1						
2						

Explain how this mobility has changed compared to 10 years ago

1. Higher frequency

2. Same frequency

3. Decreasing frequency

Specify why:

AGRICULTURE AND LIVESTOCK

General information on plots of the household (on plot level: specify per plot)

Plots	**Estimated area**	**Land use**	**Perceived location of plots**		**Ownership/ tenure** (indicate cost if rented/acre)	**Inputs** (indicate cost/unit)	**Labour**
	(Specify units)	1.Cultivated (specify crops) 2. Fallow 3. Pasture 4. Forrest 5. Other (specify___)	Specify distance in time & km		1. Owned by household 2. Rented 3. Borrowed 4.Community land 5. Owned by clan 6. State land 7. Other (specify___)	1. bought seeds 2. Inorganic fertilizer 3. Organic fertilizer 3. Pest -/ herbicides 4. irrigation water 5. other (specify___) (for each plot list all inputs)	1. Hired 2. Family 3. Combination of 1 and 2
			Time	**Km**			
1							
2							

1. Did you realize any income from sales of other (by-) products obtains from Irish potato? (circle)

= Yes 2 = No

2. If you realized income from sales of other Irish potato (by-) products, what were these products and their respective total income earned?

1st product…… ... Income earned……

2nd product…….. Income earned……

3rd product…… ... Income earned……

3. Where/ to whom do you sell your harvest? (rank)

☐ Local Assembler ☐ Local Processors ☐ Wholesalers

☐ Millers ☐ Retailers ☐ Consumers

☐ Other (Specify)…….

4. In what terms do vou sell vour harvest?

☐ Cash ☐ Credit

5. Who sets price for crop produce/crop products? (circle)

= Buyer 2 = Seller 3 = Both 4 = Other (Specify).....

6. What is your main market outlet/crop depot for Irish potato? (circle)

1 = at farm gate 2 = In the village market 3 = In markets outside the village

= NGO or donor project 5 = Farmers groups or organization 6 = other (specify)…….

7. What is your source of market information and prices of a crop produce and its products?

1= Direct visit to the market 2 = Cross check with fellow producers 3 = From friends

4= From extension officers 5 = Other (Specify)…….

8. Are you a member of any farmer association/cooperatives? (circle) 1 = Yes 2 = No

9. If yes, please list the benefits you get by being a member of the association or organization?

.....

.....

10. Please list (if there are) the disadvantages of being part of this cooperative?

.....

11. Does your association/cooperative help you to bargain market prices when selling your crop produce and/or crop products? (circle) 1 = Yes 2 = No

12. What are the five main production problems facing your household at the moment (rank them starting with the most severe)

☐ Poor farm inputs ☐ Soil fertility problems ☐ Poor access to ownership of land
☐ High input costs ☐ Unreliable rainfall ☐ Poor access to chemical inputs
☐ Destructive weed ☐ Lack of appropriate irrigation equipment
☐ Prevalence of pests & diseases ☐ Other (Specify)……

13. What are the five main marketing problems facing your household at the moment (rank them starting with the most severe)

☐ No reliable transport ☐ Market too far ☐ Open market prices too low

☐ High cost of transportation ☐ No buyers within the village

☐ Farmer association problems ☐ Government regulatory board problems

☐ Lack of market information ☐ Other (Specify)……

Changes in total size and tenure of land (in acres/ hectares) over the last 10 years

Land tenure	**Decreased** in acres or hectares:	**Same**	**Increased** in acres or hectares:	**Why?**
Owned by the household				
Rented				
Borrowed				
Community land				
State Land				
Other (specify)				

Crop output during the last 12 months per household (on crop level)

Crop Name (list 5 main crops)	**Area planted** (specify unit)		**Total production per year** (specify unit)		**Share of total production sold (in %)**	**Price** (Specify unit)			**Use of hired labour** 1. Land preparation 2. Sowing/weeding 3. Harvesting 4. Post-harvesting 5. Other (specify___) (Enter appropriate code in the appropriate column)		**Buyer** 1. Other farmer/villager 2. Farmers organisation 3. cooperative 4. Local trader 5. Company (agent) 6. Other (specify__) (Enter appropriate code in the appropriate column)			
	Amount	**unit**	**Amount**	**unit**		**Lowest price**	**Highest price**	**unit**	**Local**	**Migrant**	**Farmgate**	**Market**	**Company gate**	**Farmers organisation/ cooperative**

FINANCIAL AND PHYSICAL ASSETS

Use of credit and loans during the past 5 years

From whom/ which institution	**Purpose of credit/loan**	**Which household member(s) received this credit or loan?**		**HH member ID**	**Make use of mobile phone for banking/savings:**	
specify		HH member ID(s)			Yes (explain purpose)	No
				1		
				2		
				3		
				4		
				5		
				6		
				7		

Composition of household incomes (over the last year)

Amount total household earnings from	**Total amount (per year)**	**Which household members contribute to this item? Indicate HH members IDs (several members may contribute to an item)**
Agricultural production		
Livestock		
Self-employed work		
Salaried employment		
Casual wage work		
Pension		
Remittances		
Other (specify)		
Total		

Remittances (from family members)

Received national remittances (cash and/or kind) at the HH level (over the last year)					
Amount/type	**From whom?** (indicate HH member ID)	**How often** 1. sometimes 2. Once a year 3. Regularly	**How received**		
			Informal channel (by hand)	**Formal channel (formal financial institutions)**	**Mobile money**

Received international remittances (cash and/or kind) at the HH level (over the last year)					
Amount/type	**From whom?** (indicate HH member ID)	**How often** 1. Sometimes 2. Once a year 3. Regularly	**How received**		
			Informal channel (by hand)	**Formal channel (formal financial institutions)**	**Mobile money**

Use of received remittances during the past 5 years (cash and/or kind) – e.g. housing, agriculture, business, etc. -

Information on money and goods sent by the household during the past 5 years

To whom?	**Money (amount)**	**Goods (specify)**	**How often** 1. Sometimes 2. Once a year 3. Regularly	**How sent**		
				Informal channel (by hand)	**Formal channel (formal financial institutions)**	**Mobile money**

Expenditures and saving

Information on expenditures at the household level

Consumer expenditure	**Amount per year**	**Productive expenditures**	**Amount per year**
Food		Hired labour	
Drinks		Hired equipment	
Clothes		Transport	
Utilities (water, energy,..)		Membership fee cooperative	
Rent		Seeds	
Transport		Fertilizer	
Medical		Water (irrigation)	
Schooling		Other (specify)	
Social: celebrations, weddings, funerals,etc.			
Other (specify):			
Total		**Total**	

Total annual expenditure of the Household:	

HH head: Who in your household decides on expenditures?		
Would you be willing to receive us again for a follow-up interview?	**Yes**	**No**

Does the household manage to save money each year?	**Yes**	**No**
If so, how much (on average):		

Length of interview	**Start:**	**End:**	**Total time (in minutes):**

Appendix 2: Traders (wholesalers/retailers) survey questionnaire

Economic analysis of Irish potato value chain in Njombe urban and Wanging'ombe districts, Tanzania

1.0 Region …….. 1.1 District ……

1.2 Ward..... 1.3 Village …….....

1.4 Sub-village…….

2. Sex of respondent: (circle) 1 = Male 2 = Female

3. Age of respondent.....

4. Marital status of respondent: (circle)

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

5. Level of education of respondent: (circle)

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

4 = Tertiary education

6. Type of trader involved: (circle)

1 = Wholesaler 2 = Retailer

7. What was your initial capital? (In TZS)…… Source……

8. Who are your sources of the crop produce/crop products? (rank)

☐ = Farmers ☐ = Local assembler ☐ = Local processors ☐ = Transporters

☐ = Wholesalers ☐ = Other (specify) ……

9. If crop produce	10. If crop product (specify the product)……
At what average price do you buy crop produce? (InTZS)……/kg/bag/tone. (Select the appropriate units).	At what average price do you buy crop product? (In TZS……../kg/bag/tone. (Select the appropriate units).
Approximately what was the total amount of crop produce did you buy last year..... bags ..... kgs. (Select the appropriate units)	Approximately what was the total amount of the crop product did you buy last year..... bags ..... kgs. (Select the appropriate units)

11. Who sets price for crop produce/crop products? (circle)

1 = Buyer 2 = Seller 3 = Both 4 = Other (Specify).....

12. What factors are considered in setting the buying price for crop produce/crop products? (rank)

☐ = Moisture content ☐ = Weight ☐ = Supply forces

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

13. In what form do you buy crop product? (circle)

1 = Raw 2 = Processed 3 = Other (Specify)……..

14. 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**	**Constraints in the activities**
Preservation/handling				
Storage				
Transport				
Processing				
Other (specify)				

15. If storage, what are some storage techniques you are engaged in and how long do they help preserve this crop produce?

Technique Duration of storage

…… ……...

…… ……...

16. If transportation, what mode of transport do you use? (circle)

1 = By head 2 = Bicycle 3 = Public transport 4 = Truck/ pick- up

5 = Other (specify) ……

17. Is the transport mode own or hired? (circle)

1 = Own 2 = Hired

18. Do you share this mode of transport with others? (circle)

1 = Yes 2 = No

19. If yes, how do you share the costs? (circle)

1 = By weight/ volume 2 = Per trip 3 = Equally 4 = Per distance

5 = Other (Specify)…….

20. How is the transport cost determined? (circle)

1 = Per weight/volume 2 = Per distance 3 = Per trip 4 = Other (specify)……

21. Where/to whom do you sell your product? (rank)

☐ = Wholesalers ☐ =Industrial processors/Millers ☐ = Retailers ☐ = Consumers

☐ = Other (Specify)……

22. At what price do you sell your products? (In TZS)……. /kg/bag/tone. (Circle the appropriate unit).

23. What quantity did you sell last year?……. bags…….kgs. (Select the appropriate units)

24. What criteria do you use in determining the selling price? (rank)

☐ = Moisture content ☐ = Weight ☐ = Supply forces

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

25. Do you buy products on behalf of others? (circle)

1 = Yes 2 = No

26. If yes, how much commission do you get? (In TZS)……..…. /Kg/ bag/ tone (Select the appropriate units)

27. Are you a member of any association/cooperatives? (circle)

1 = Yes 2 = No

28. If yes, what benefits do you get by being a member of the association or any other organization?

.....

.....

29. Do you have any contractual agreement with suppliers of products? (circle) 1 = Yes 2 = No	30. Do you have any contractual agreement with buyers of products? (circle) 1 = Yes 2 = No
If yes, please indicate the kind of agreement? 1 = formal contracts 2 = informal contracts	If yes, please indicate the kind of agreement? 1 = formal contracts 2 = informal contracts
What does the contract specify? ☐ Price..... ☐ Quality..... ☐ Time.....	What does the contract specify? ☐ Price..... ☐ Quality..... ☐ Time.....

31. Is there any credit institution in your village/town? (circle) 1 = Yes 2 = No

32. If yes, list them and briefly explain how they support you?

……

……

33. What are their interest rates?

……

34. What is your opinion on the quality of products that you buy?

……

……

35. Please list major business constraints faced and proposed solutions?

Constraints	**Proposed solutions**
……	……..……
……	…….
……	……..

THANK YOU FOR YOUR TIME

END

Appendix 3: Processor survey questionnaire

Economic analysis of Irish potato value chain in Njombe urban and Wanging'ombe districts, Tanzania

1.0 Region …….. 1.1 District …….....

1.2 Ward..... 1.3 Village …….....

1.4 Sub-village……

2. Sex of respondent: (circle) 1 = Male 2 = Female

3. Age of respondent.....

4. Marital status of respondent: (circle)

1 = Married 2 = Single 3 = Divorced 4 = Widowed

5. Level of education of respondent: (circle)

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

4 = Tertiary education

6. Do you add value to a roots crop produce after purchase? (circle)

1 = Yes 2 = No

And, how do you add this value?

……

……....

8. Are there other processing methods you know? (circle)

1 = Yes 2 = No

If yes, list them

……

……...

9. What is preventing you from using the above listed approach(s)?.....

10. Approximately what was the total amount of crop produce did you buy last year?

.....bags .....kgs. (Select the appropriate units)

11. What quantity did you processed last year?

…….bags…..…….kgs. (Select the appropriate units)

12. What causes the difference?.....

13. Who are your sources of the crop produce? (rank)

☐ = Farmers ☐ = Other processors ☐ = Wholesalers ☐ = Retailer

☐ = Other (specify)……

14. At what average price do you buy this crop produce? TZS…….. /kg/bag/tone. (Circle the appropriate unit)

15. Who sets price for crop produce? (circle)

1 = Buyer 2 = Seller 3 = Both 4 = Other (Specify).....

16. What factors are considered in setting the buying price for a crop produce? (rank)

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

☐ = Demand forces ☐ = Quantity ☐ = Other

(Specify)……..

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

1= Transport…….. 2= Storage…….

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

18. Do you have an association/cooperative as processors which help you to bargain on influence market price when buying/selling your crop produce/crop products? (circle)

1 = Yes 2 = No

19. Where do you sell your products and in which form?

……

20. What is the selling price? (In TZS)……. /kg/bag/tone. (Select the appropriate units).

21. What are some storage techniques you are engaged in and how long do they help preserve this crop produce/crop products?

Technique Duration of storage

……...

……

22. Please complete the table below

Equipment/tools for processing	**Supplier/ Where you bought it from**	**How much did you purchase it**	**How much can you sell them now**

23. How can you describe your relationship with the supplier and buyer of crop produce/crop products? (circle)

Supplier 1 = Very good 2 = Good 3 = Average 4 = Poor

Buyer 1 = Very good 2 = Good 3 = Average 4 = Poor

24. Did you get any training on processing? (circle) 1 = Yes 2 = No

25. If yes, from whom and on what issues?

……

26. Do you need training on processing? (circle) 1 = Yes 2 = No

27. If your answer is yes, on what issues and why?

……..

…….

28. Please list major business constraints faced and proposed solution:

	Constraints	**Proposed solutions**
In buying	…… ……	…….. ……..
In storage	…… …….	……... ……...
In marketing	…… …….	…… ……

THANK YOU FOR YOUR TIME

END

Appendix 4: Domestic consumers survey questionnaire

Economic analysis of Irish potato value chain in Njombe urban and Wanging'ombe districts, Tanzania

1. Name of respondent.....

2.0 Region …….. 2.1 District ……

2.3 Ward..... 2.2 Village …….....

2.3 Sub-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. Where/ from whom do you usually buy a crop produce/crop product? Please rank

☐ Retailers ☐ =Wholesalers ☐ = Small-scale processors ☐ = Farmers

☐ = Others (specify)……

8. At what price do you buy a crop produce/crop product? TZS..... /kg/bag/tone.

(Select the appropriate units).

9. What do you look for when buying a crop produce/crop product? Please rank

☐ = Quantity/measurement ☐ = Size ☐ = Cost ☐ = Others

(specify)……

10. Who set the price of a crop produce/crop products?

1= Buyer 2= Seller 3=Both 4= Other (Specify)……

11. What factors are used to set the price? Please rank

☐ = Supply forces ☐ =Demand forces ☐ = Quality ☐ = Grade ☐ = Other

(Specify)……...

12. What quality attributes are you looking at when buying a crop produce/crop products? Please rank

☐ = Size ☐ = Test ☐ = Shape ☐ = Other (Specify)……..

13. Are you satisfied with the way in which the product is packaged and measured?

1= Yes 2= No.

If 'Yes' why?	If 'No' why?
……	……
……	……

14. What would you like to see changed to improve the quality the product being sold for human consumption?

……

……

THANK YOU FOR YOUR TIME

END

Appendix 5: Variance inflation factors results for multi-collinearity test

Variable	VIF	1/VIF
Irrigation (dummy)	1.47	0.6818
Farm location	1.85	0.5419
Farm size	1.89	0.5299
Primary education(dummy)	1.53	0.6551
Loan (dummy)	1.10	0.9062
Income_2	2.23	0.4478
Secondary education(dummy)	1.37	0.7326
Age_2	1.17	0.8519
Gender	1.10	0.9053
Famer's group	1.07	0.9338
Mean VIF	1.48	

There was no evidence of multicollinearity

Appendix 6: White's test for heteroscedasticity

Ho: homoskedasticity

Ha: unrestricted heteroskedasticity

Chi2 (58) = 46.25

Prob > chi 2 = 0.8668

The null hypothesis was not rejected; hence there was no evidence of heteroscedasticity