

BISHOP STUART UNIVERSITY



Factors Influencing Smallholder Farmers' Participation in Irish Potato Value Addition in Ndorwa County West, Kabale District

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Declaration

I, Akankunda Loydah, declare that this dissertation titled "Factors influencing small holder farmers' participation in Irish Potato value addition in Ndorwa County West, Kabale District" is my original work and has not been presented for any award in any University.

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Approval

We the undersigned certify that this dissertation has been submitted to the Directorate of Graduate Studies, Research Grants and Publications of Bishop Stuart University with our approval as academic supervisors to the student.

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Dedication

This dissertation is dedicated to my beloved husband and family for their encouragement, and spiritual and financial support for higher studies.

Acknowledgment

I thank the Almighty God for his grace and the abundant blessings I have received from him.

I sincerely appreciate my academic supervisors Dr. Kalibwani Rebecca and Mr. Tumusiime Bernard who guided me during this research work.

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List of Abbreviations

CIP	International Potato Centre
FAO	Food and Agriculture Organization
IFDC	International Fertilizer Development Centre
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MCT	Marketing Channel Theory
NARO	National Agricultural Research Organization
NGOs	Non-Governmental Organizations
R&D	Research and Development
SACCOs	Savings and Credit Cooperative Organizations
SSA	Sub-Saharan Africa
UIRI	Uganda Industrial Research Institute
UNSPPA	Uganda National Seed Potato Producers Association
VSLAs	Village Savings and Loan Associations
ZARDI	Zonal Agricultural Research Development Institute

Abstract

This study investigated the factors influencing small holder farmers' participation in Irish potato value addition in Ndorwa County West, Kabale District. The specific objectives were to; identify actors, services, and processes in the potato value chain and to establish the socio-economic and institutional factors influencing participation in the potato value chain. The study was a cross-sectional descriptive survey employing both qualitative and quantitative approaches to data collection and analysis. Data was collected from 206 smallholder farmers and other value chain actors (input suppliers, commission men, rural hawkers, traders, wholesalers, retailers, and consumers) using questionnaires and interviews. Data management and analysis were done using SPSS version 20 to generate both descriptive and regression statistics. The potato value chain of Ndorwa west consists of five major players that are input suppliers, producers, retailers, processors, and consumers as opposed to the national standard value chain that consisted of; input suppliers, producers, commission men/ brokers, rural hawkers, local traders, traveling traders, wholesalers, retailers, consumers, processors and support providers (indirect actors). The main socio-economic factors influencing small holder farmers' participation in potato production and value addition are; gender, access to capital, access to technology, household size, quantity harvested, engagement in off-farm activities, and group membership. Access to credit services, un-reliable power, lack of value-addition information, and lack of formal arrangements along the value chain were the main institutional factors influencing small holder farmers' participation in potato value addition. As a result, the study confirmed that there is a difference between the potato value chain of Ndorwa west and a standard value chain as well as significant factors influencing participation in potato value addition. It is, therefore, recommends farmers form groups that may help them pool enough resources for technology improvement, boost production, and access credit services. Potato value chain actors should also be supported in their groups and females trained in value addition and processing of potatoes to compete favorably with the male actors. Value chain actors need to access the necessary information on value addition through training, exposure visits, seminars, and on-farm visits by agriculture extension workers for follow-up.

Chapter One: Introduction

1.1 Background of the study

Potato (*Solanum tuberosum L.*) is one of the most widely grown tuber crops in the world. It is the primary stem tuber crop planted practically everywhere in tropical and subtropical countries, as well as in warmer parts of temperate regions (Bezabih et al., 2015; Hirpa et al., 2016).

Following rice, maize, and wheat as the fourth-most significant food crop in the world is the Irish potato (Tatwangire, 2014). More than 100 countries grow it, and more than 1 billion people worldwide consume it (Kato, 2015). By the end of 2017, there were more than 420 million tons of Irish potatoes produced worldwide, with China being the largest producer at about 570.6 thousand tons (26.4%), followed by the Russian Federation at 372.7 thousand tons (17.2%), and India at 344 thousand tons (15.9%) of global production (FAO, 2012). Since its debut, Irish potato production and consumption have increased (CIP, 2010; FAO, 2012).

Production of Irish potatoes has been rising steadily in developing nations. For instance, the production of potatoes in the developing world climbed from 10.5% in 1961 to 47.2% in 2012, a significant rise (Kyomugisha et al., 2013). Africa is one of the emerging nations that contributes more than one-third of the world's Irish potato production. South Africa, Egypt, Algeria, and Morocco are among the African nations that grow a significant number of Irish potatoes (Wasukira et al., 2014). Along with rising production, Irish potato consumption has increased in developing nations as well, going from 9 kg per capita in 2001–2003 to 14 kg per capita in 2014–16. (FAO, 2012).

Potato is one of the main food crops grown in the majority of countries in Sub-Saharan Africa (SSA). About 30% of the world's potato production comes from SSA nations (Bajracharya

&Sapkota, 2017). In addition, the production of potatoes is rising faster than that of the majority of other crops. As a result, potato farming and value addition are becoming one of the primary sources of revenue, rural employment, and food for expanding populations (Sapkota &Bajracharya, 2018). In terms of importance, potatoes currently come in fourth place among SSA's food crops. Since 1965, it has more than doubled in production in these nations. In many of the densely populated highlands of SSA, potatoes serve as both a food source and a source of income. Kenya, Uganda, and Ethiopia are three of the ten African nations with the most land devoted to potato farming in Sub-Saharan Africa (Gairhe &Timsina, 2017). Though potato production is seemingly high in different regions of SSA, value addition has remained a critical issue for most governments. In addition, smallholder farmers' participation in value addition remains a big challenge due to small volume harvests, poor infrastructure and technology, and lack of credit services (Tolno et al., 2016).

In Uganda, potato is both a food security and cash crop. Quantity demanded is estimated to reach 42.8% by 2022 compared to 28.5% of the year 2015 due to the continuously growing population (Apolo et al., 2015). It is one of the 12 agricultural commodities prioritized by the Government of Uganda (Sebatta et al., 2014). FAO, (2012) estimated potato production at 800,000 metric tonnes per annum (7.14 tonnes per ha). However, only a quarter of the potato is subjected to value addition due to a lack of technology and limited financial capacity among others. Value addition is mainly done by large-scale processors positioned in large urban areas.

The rapid growth in farmer engagement in potato production, value addition, and the market is attributed to rapid urban population growth and changing food-eating habits of urban dwellers. This has a strong impact on potato markets, creating opportunities for smallholder farmers but also posing serious threats due to competition with larger suppliers of potatoes globally

(Mugisha, Katungi, L. and Katwijukye, 2010). Although Uganda is ranked third producer of potatoes in East and Central Africa, the bulk of the crop produced (80%) is consumed domestically, implying limited participation in regional markets which is partly attributed to several factors including small volume harvest and limited per capita value added.

Despite the growing demand for potatoes both locally and in urban markets, potato value chain actors continue to exhibit low per capita value-added products due to different socio-economic and institutional influences (Byamugisha, 2014). Potato chain players lack capital and appropriate technology to add value to the product hence affecting incomes and the overall efficiency of the chain. Although Uganda has a growing potato value chain, smallholder farmers continue to complain of limited market access in terms of low prices, limited outlets, and hence low net returns (Byamugisha, 2014).

The problem of limited market access is associated with lack of participation and inefficiencies along the market chain that starts from a smallholder farmer to the final consumer (Kyomugisha et al., 2012). The chain actors generally lack sufficient knowledge, information, and enough resources to help them add value, and meet quality standards and formal market specifications (Wasukira et al., 2014), hence limiting their access to lucrative markets. The causes of market inefficiency are partially documented (Kato, 2015). It is therefore imperative to understand the level of potato value addition and chain development and limiting factors to recommend alternative value addition options the farmers and other actors could choose from to improve gains from the potato value chain. This study therefore determined factors that influence potato value addition in Ndorwa County west, Kabale District.

1.2 Statement of the problem

Potato is a key food and cash crop in Uganda, and national production has steadily grown over time in response to increasing demand and consumption. Potato production increased to 327,000 MT in 2021 from 155,000 MT in 2005–06 (UBOS, 2021), which is attributed to increased land under production. Likewise, the demand for Irish potatoes has also increased to over 850,000 MT per year, with urban demand outpacing rural demand. With the increasing urbanization, changing eating habits of the majority of youth, and high population growth, potato consumption is set to rise by 50% over the plan period, offering the potato industry huge opportunities for enterprise development and economic growth (ASSP 2015/6–2019/20). Demand for potato products exceeds the country's current supply which presents the potential for the potato sector in the country and neighboring regions. Meeting this growing demand versus low supply requires that more actors participate in the production and marketing of the crop (Apolo et al., 2015). Ndorwa County West in Kabale District happens to be among the top potato-producing areas in Uganda (Sebatta et al., 2014). Despite the growing demand for potatoes from the locals and surrounding districts in the region, chain actors continue to exhibit low per capita value-added product and value chain participation (Sebatta et al., 2014) yet potato products are becoming ever more competitive because of the relatively high gross profit. This not only limits market access and income of chain players but the overall development of the sector in the area (Byamugisha, 2014). There is a general lack of information about the reasons behind poor potato value addition in Ndorwa County west given that no study has been done to explore such factors in the area. Understanding factors influencing potato value addition was a key to unlocking the market potential for chain actors and overcoming value chain participation hindrances for smallholder farmers.

1.3 Study objectives

1.3.1 General objective

To determine factors influencing small holder farmers' participation in potato value addition in Ndorwa County west of Kabale district.

1.3.2 Specific objectives

1. To identify actors, services, and processes in the potato value chain of Ndorwa west and compared it with a standard value chain.
2. To establish the socio-economic factors influencing small holder farmers' participation in potato value addition in Ndorwa County west.
3. To establish the institutional factors influencing small holder farmers' participation in potato value addition in Ndorwa County west.

1.3.3 Research questions

1. Who are the actors, services, and processes in the potato value chain of Ndorwa west as compared to a standard value chain?
2. What are the socio-economic factors influencing small holder farmers' participation in potato value addition?
3. What are the institutional factors influencing small holder farmers' participation in potato value addition?

1.4 Justification of the study

Kabale district is one of the potato producing areas in Uganda where farmers are still challenged with inadequate storage facilities, poor value addition technologies, getting difficult to access

market as well as getting little income for their products. This not only affects market participation but equally threatens the future of the potato sector. Therefore, analyzing the factors influencing value chain participation and seeking new market opportunities through value addition is crucial for value chain development and better prices for farmers. This explains why factors influencing small holder farmers' participation in potato value addition are worth studying with special reference to Ndorwa County west, Kabale district. Potato production and value development activities play an important role in supporting the local economy by contributing to subsistence food security, and nutrition, generating additional employment and income through local, regional, and national trade.

1.5 Scope of the study

1.5.1 Geographical scope

This study was conducted in Ndorwa County West, Kabale District. Ndorwa County is an administrative sub region in Kabale District in Western Region in Uganda. It is bordered by Kabale municipality to the north, Buhara sub county to the east, Rwanda to the south and Bubare sub county from Rubanda district to the west. It lies under coordinates 1°15'00.0"S (-1.2500000°) and 30°00'00.0"E (30.0000000°). The estimate terrain elevation above sea level is 1964 metres. The national census in 2012 estimated the population at 65,340. The major economic activity of the people in the area is agriculture with crop farming and small scale livestock being the backbone. The agro-climatic conditions in the area present a favorable environment for the production of crops like potato all year round. Potato production is mainly for food and income generation. The choice of the study area was made since it is one of the

regions in the district that produces Irish potatoes. However, there was scant information on the growth of the potato value chain and value addition in the region.

1.5.2 Content scope

This study focused on the actors, services and processes in a standard potato value chain as compared to the value chain in Ndorwa County West, socio-economic and institutional factors influencing small holder farmers' participation in potato value addition.

1.5.3 Time scope

The study was conducted from October 2019 to June 2021. It reviewed literature for a period of 9 years (2010 – 19). It was within this time frame that Government of Uganda had embarked on developing the potato sector by promoting value chain participation as a food security and poverty elevation strategy in producing areas.

1.6 Significance of the study

The findings of the study will enable farmers to gain enough knowledge to turn the potato sector into a sustainable production activity by highlighting the cheapest value addition options.

The findings may help farmers to discover new mechanisms of identifying various market options in different areas.

The study will act as an informative tool for policy implementers by identifying value chain and value addition challenges and hence help policy makers in designing all the foreseeable strategies to combat the challenges.

1.7 Theoretical framework

The Marketing Channel Theory serves as the study's foundation (MCT). The system of marketing institutions via which commodities or services are moved from the original producers to the ultimate users or consumers is referred to as the "channels of distribution" according to Giles (1973). The majority of the time, a physical product transfer is necessary, although, on occasion, an intermediary marketing organization may acquire title to the items without ever touching them. These middlemen make up a distribution channel, trading channel, or marketing channel (Sapkota & Bajracharya, 2018).

Tolno et al., (2016) defined marketing channels as “alternative routes of product flows from producers to consumers. The marketing channel starts at the farm-gate and ends at the consumer’s front door. The marketing channel approach focuses on a firm’s selling strategies to satisfy consumer preferences (Gairhe, Gauchan & Timsina, 2017). Producers, wholesalers, and retailers as well as other channel actors existing in the channel carry out marketing function that contributes to the product flow. This widens the marketing choices for a farmer and hence leads to the growth of potential marketing channels which in turn contribute to better prices and high gross margins. Sapkota & Bajracharya, (2018) reported that marketing channels in Uganda consists of farmers/producers, village traders, urban brokers, wholesalers, processors and consumers. Mahlet et al., (2015) reported that Irish potato marketing channel consisting of producers, truckers, wholesalers, retailers, hawkers and consumers.

1.8 Conceptual Framework

Figure 1: Illustrates how potato value chain participation depends on socio-economic factors (variables) such as: labour, land, capital, technology, access to information and quantity harvested, and institutional factors such as extension services and access to finance. These

factors affect farmers’ decisions to participate in the chain. Participation in the potato value chain improves access to information, increases per capita value-added products, increases smallholder incomes and improves quality and quantity as well as exports.

Independent variables

Dependent variable

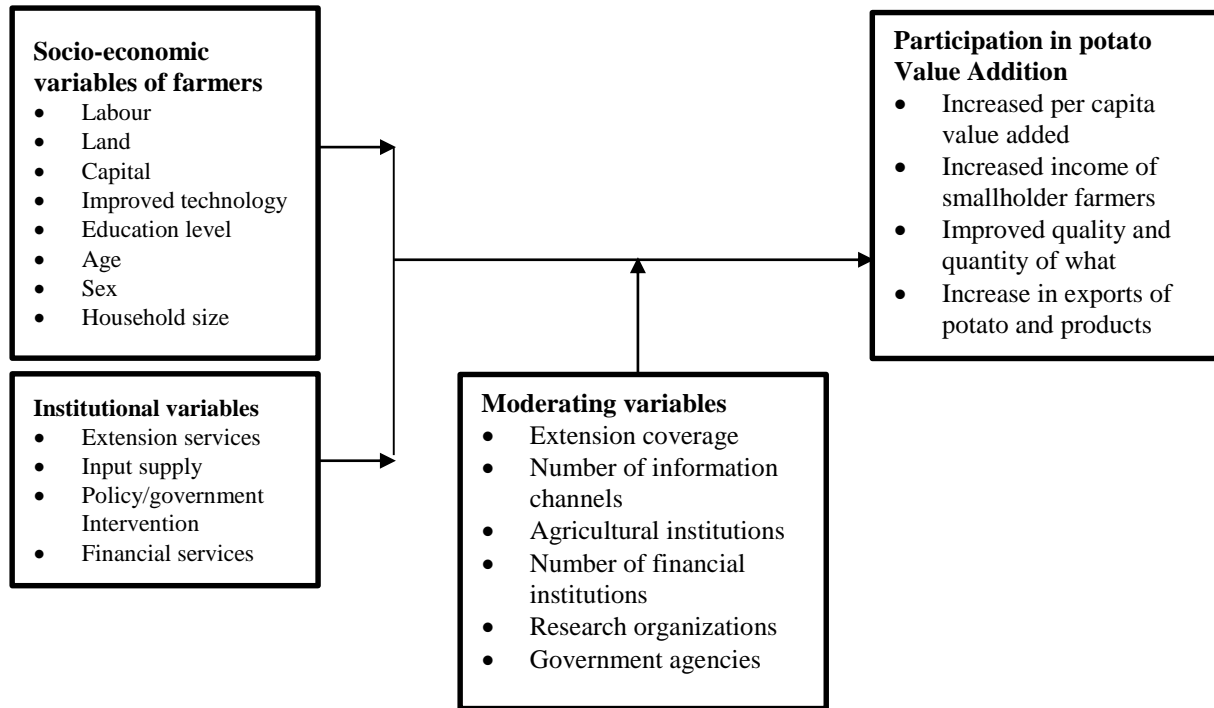


Figure 1: Conceptual framework

Source: Adapted from Nyunza and Mwakaje (2012) and modified by the researcher

1.9 Operation definitions

Value chain: A value chain is the full range of activities required to bring potatoes through the different phases of production and transformation to consumption. The potato value chain is made up of a series of actors (or stakeholders) from input suppliers, producers, and processors, to exporters and buyers engaged in the activities required to bring the agricultural product from its production to its end use.

Potato value chain actors: this is a chain of actors/people who directly deal with Irish potato and its products, i.e. produce, process and trade.

Value chain supporters; the services provided by various actors who never directly deal with the potato, but whose services add value to the product.

Value chain influencers: The regulatory framework, policies, infrastructures, etc.

Value chain upgrading: Upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities. Upgrading in firms can take place in the form of process upgrading, product upgrading, functional upgrading, and chain upgrading.

Chapter Two: Literature Review

2.0 Introduction

This chapter explored literature on factors influencing potato value chain development. It examined key concepts and reviews secondary information on the potato value chain actors, services, and processes in the value chain at both national and district levels, as socioeconomic and institutional factors influencing small holder farmers' participation in potato value addition.

2.1 Actors, services, and processes in a standard potato value chain as compared with the value chain at a local level.

2.1.1 Actors, services, and processes in a standard potato value chain

Input suppliers are many actors engaged directly or indirectly in agricultural input supply in the study area (Gumataw et al., 2016). These include the district agriculture office, seed multiplying centers, private traders, cooperatives, and farmers. These input suppliers provide potato seeds, fertilizers as well as pesticides, and herbicides. Potato producers use seeds from different sources including the government (NARO), local farmers, cooperatives, traders, and own production (Bezabih et al., 2015).

Producers own an average land size of about 2.5 hectares per household. Of these are potato growers who perform different activities from potato production to marketing (ICAT, 2014). The major value chain functions that potato growers perform include planting, fertilization, weeding, pest/disease control, harvesting, post-harvest handling and transporting to selling areas. Potato growers are the major actors who perform most of the value chain functions right from farm

inputs preparation on their farms or procurement of the inputs from other sources to post-harvest handling and marketing (Mahlet Abitew et al., 2015).

Commission men are actors who usually grant broad powers to those who consign goods to them. These actors play a crucial role in the potato marketing system by facilitating potato transactions and linking producers with other actors (Mwangi et al., 2013). These actors were working for local traders in the study area. They move down to communicate with producers and set selling prices for potatoes as far as possible. They offer quick and readily information regarding the potato marketing system. They also play an important role in linking farmers to the market and other stakeholders of the commodity chain while the probability of market accession of farmers is limited (Kato, 2015). They sometimes go beyond the facilitation of transactions and tend to control and fix prices, create price symmetry and make extra benefits from the process in addition to convincing the producers to sale their produce at the prices set by traders. They do not follow proper business conduct and as a result they constrain the marketing system sometimes

Rural hawkers are potato vendors who are usually few in numbers and not widely available in the region but they are not organized in business arena. Rural vendors/hawkers buy Irish potato direct from farmers. They deal in low volumes due to inadequate capital and know where to sell. Their major transport means is bicycle and or by hiring a motorcycle (Kyomugisha, et al., 2012).

Local traders serve as potato buyers as well as input raw input suppliers. They are somewhat strong financially as well as management know how in all aspects of the business activity in relative with actors of this chain. They purchase potato from producers directly by physically and by commission men (Wasukira et al., 2014). Local traders have opportunities to sell their potato directly to wholesalers and retailers. Local traders have a great role in the transaction of the

potato produced by farmers and they are price makers at all farm gate transaction in the study area. The coupled effect of excess supply and perishable nature of potato obliged producers to sell at prices determined by local traders or commission men (Yazie et al., 2015).

Travelling traders are traders who own trucks or hire trucks to purchase ware potato from production areas. Such traders have no direct contact with the buyers whatsoever, so they rely entirely on brokers through a 'gentleman's agreement'. Upon agreeing a price with the travelling trader, the broker then negotiates for a 'good' price with the buyer. However, the trader may reduce the price in the case of low turnover to avoid overhead costs such as transport surcharges from truck owners, overnight parking and lodging (Abraham, 2013).

Wholesalers are well equipped with marketing facilities- transport, storage, and communication and with functionaries like commission men, weigh man, etc. In most cases in the potato market chain, the role of wholesalers appears to be taken over by brokers, who have become one of the most prominent participants in the potato marketing chain. In rural areas, brokers are the contact between travelling traders and wholesale buyers and farmers, as well as the key link between farmers and traders (Bongiwe and Masuku, 2012). Brokers do not invest any money, but thrive on a commission rate per bag, which is negotiable between travelling traders depending on the market forces. After agreeing on a price with the travelling traders, brokers then set whatever price they can negotiate with the buyers. These buyers may be retailers, ranging from supermarkets to other urban markets in and outside Kampala city, or hotels, restaurants and fast food outlets that mainly process potato into chips, crisps, boiled vegetables, soup and salad. Brokers are an organized and influential group in the market (especially at St. Balikuddembe market) and few travelling and village traders are able to sell directly to the large buyer or urban retailers, even though they are classified as wholesalers (Gairhe et al., 2017).

Retailers are actors who sell potato in small quantity as per the consumer's requirements. Potato retailers range from supermarkets to village roadside sellers (Bajracharya and Sapkota, 2017). In urban areas, market retailers buy 1-5 bags from brokers and then sell them in heaps of various sizes and grades for amounts ranging from US\$500 to US\$ 2,000 per heap. Retailers' activities in potato marketing system include buying, transporting to retail areas, and selling to consumers. They are key actors and last link between producers and consumers. Most of retailer bought potato from wholesalers and resold to urban consumers. Sometimes they could also directly buy from the producers (Sebatta et al., 2014).

Potato consumers include households, restaurants and institutions. Potato outputs are transported from villages and sold to processors (Hotels and Restraints) (Sebatta et al., 2014).

Support service providers (Indirect actors) are essential for value chain development and include sector specific input and equipment providers, financial services, business management services, and market information access and dissemination, technology suppliers, advisory service, etc. In the study areas, there are many institutions supporting the potato value chain. The most common support providers are Agricultural Offices, private companies; research centers traders, Cooperative and custom and revenue office, Universities (Sebatta et al., 2014).

2.1.2 Actors, services and processes in the value chain at local level

Input suppliers are not vertically integrated with producers, farmers normally search seeds for planting from their fellow farmers not from recognized source/agent (Sapkota and Bajracharya, 2018). There is farm gate levy which producers pay fees before transporting the products to the buyers. However, suppliers of machine, spare parts and packaging materials do not interact with producers/processors at all and R&D is not vested to this crop unlike other roots crops (MahletAbitew et al., 2015).

Potato producers sell part of their harvested potato to traders or fellow farmers with food shortages within the villages or nearby villages. The amount sold varies by the size of potato fields, amount harvested and food requirement of household (Gairhe and Timsina, 2017). Producers who are processors also sell processed products at household home or at the village-open markets (auction) every Sunday to end users consumers. Usually producers have access to marketing information on prices by direct visit to auction or hearing from their fellow friends (Sebatta et al., 2014).

Bargain is mostly on an individual basis. They do not make any pre-arrangement with vendors or traders in selling their potatoes. Also, very interesting story, producers play a dual role as a processors also, you can't separate characteristics and functions of the two actors (Bajracharya and Sapkota, 2017).

Potato vendors (rural hawkers) are few in numbers and not widely available in the region but they are not organized in business arena (Bajracharya and Sapkota, 2017). Rural vendors/hawkers buy fresh potato direct from farmers. They limited by inadequate by capital and know where to sell. Their major transport means is bicycle and or by hiring motorcycles (commonly known as *boda bodas*).

Practically no small traders are involved in this business. The reason could be due to limited information on production and marketing of potato (Bongiwe and Masuku, 2012).

Processors are also potato growers per se mainly engaged in processing of fresh potato (Apolo et al., 2015). At present they have very limited technologies of processing potato as their raw materials in producing products. The work is done manually at small scale level with no idea to scale up the technology.

Retailers are both urban and rural retailers involved in selling fresh and /or dried potato. Their selling points are at town markets, village centres and along road sides. They buy from farmers or big traders in the region. They manage only small quantities such as 300kg (3bags) to 10,000 kg (10bags) of fresh potato per trip for up to 7 days of selling. In addition-, they process the product at the market place to avoid decaying of the produce due to shorter shelf life. Retailers can buy potato from farmers (Apolo et al., 2015).

Consumers include households, restaurants and institutions. Potato outputs are transported from villages and sold to processors (Hotels and Restraunts) ((Byamugisha, 2014).

2.2 Socio-economic factors influencing small holder farmers' participation in potato value addition

According to (Byarugaba and Imelda, 2013) value chain actors lack capital to take on some of the new technologies such as improved packaging material, inputs and processing facilities. Coupled with limited marketing expertise, exploiting regional and international markets in case of processors is a problem because they cannot meet the required quality standards. Farmers complain about the high cost of inputs, which partly affects crop productivity.

Uganda's agriculture is rain-fed, hence potato production and supply is largely influenced by weather changes. Furthermore, irregular supplies are due to the fact that most farmers produce potato on a subsistence basis and they are not properly organized to market their produce collectively. Farmers find it difficult to ensure regular supplies and contracted quantities to potential buyers (Haverkot and Struik, 2015).

Byamugisha, (2014) states that potatoes are perishable and because farmers lack proper storage facilities on-farm they only harvest upon identifying potential buyers for their crop. Therefore

they cannot regulate supplies on the market to influence better prices thus affecting their incomes. A poor decision on storage combined with lengthy storage times expose farmers to total marketing losses in case the store is not of a good grade. Travelling traders/wholesalers sometimes are forced to undercut the prices to reduce on post-harvest losses and costs.

Poor quality potatoes; The quality of potatoes presented for marketing is generally low particularly due to the lack of improved technologies in potato production and handling techniques. The main causes of quality loss are disease and pest damage, bruising during packaging and transportation, poor sorting and grading, and greening (MAAIF, 2012).

High costs of transport affects getting the commodity to urban markets. This constraint is exacerbated to a large extent by the commodity's perishability and bulkiness. The Irish potato growing areas are geographically isolated from urban markets; hence the high transport costs (Bonabana-Wabbi et al., 2013).

A study by Netsayi et al., (2015) confirmed that the total amount of potato produced and supplied on the market had a statistically significant relationship. Farmers who produced more amount of potato per hectare supplied more potato to the market than those who produced low amount of potato. The result of the study also showed that a unit increase in the quantity of potato produced resulted in an increase of 0.551 quantity of potato supplied to the market.

Addisu et al., (2014) discovered a significant association between farming experience and the possibility of farmers to participate in potato value chain. This is because as a farmer becomes experienced, he or she could increase productivity of potato. As a result, market supply or willingness to participate in the market could be increased. According to his results, an increase in a farmers' experience by a year, increased the chances of market participation by 12%.

A study by Birachi et al., (2013) indicates that distance to the nearest market had a significant effect on farmers' participation in potato supply chain. Farmers in distant areas have less chances of participation due to bulkiness and transport costs compared to farmers in nearby areas. His results indicated that an increase in distance to the nearest market by a kilometer reduced the likelihood of a farmer participating in the market by 12%. This is because the more the distance to the market, the more the marketing costs (in terms of transportation, labor, loading and offloading and personal travel costs) (Gumataw et al., 2016).

Abraham, (2013) conducted a study on horticultural value chain in Eastern parts of Ethiopia identified constraints on the chain. The study identified the major marketing constraints such as huge number of middlemen in the marketing system, lack of markets to absorb the production, lack of marketing institutions safeguarding farmers' interest, low price for the products, rights over their marketable produces, imperfect pricing system, lack of coordination among producers to increase their bargaining power, lack of transparency in market information communications and poor product handling and packaging.

According to Byamugisha, (2014) many farmers decide to sell fresh potato because they do not have dryers. Due to poverty levels, raising money to invest in any solar machines for serving the drying purpose remains a critical problem. Potatoes are well known as perishable crops yet farmers still do not own refrigerators since they cannot afford thus risking their products to rot.

Perishability also limits the period of time during which a product can be marketed as a fresh commodity or used as a raw material in processing. Where HVACs are used for processing, processors are usually subjected to high transaction costs as the product will be repeatedly screened and graded for quality at every respective stage in the value chain (Kyomugisha et al., 2012). In attempting to prolong the freshness and quality of perishable commodities, producers

and market intermediaries are required to invest in highly specialized transport and storage facilities. However, poor (or lack of) rural electrification in some developing countries (Apolo et al., 2015) places constraints on where production and processing activities can be located.

2.3 Institutional factors influencing small holder farmers' participation in potato value addition

In a study by Bonabana-Wabbi et al., (2013) majority of the market actors had limited or no access to reliable information about the potato market regarding prices, volumes, demand market opportunities and prospects. The broker's controlled the flow of market information, especially concerning market opportunities, making it difficult for other actors to penetrate better markets. Sapkota and Bajracharya, (2018) captured a significant association between access to market information and farmers' participation in potato value chain. A positive coefficient established implied that an increase in access to market information would increase market supply of potato. According to the study, farmers who had good access to market information (selling price, place where and time when they sell) were likely to produce more quantity of potato and supply more potato to the market.

The most important constraints that are faced by the farmers in the potato production in Uganda, are; lack of established markets, insufficiency extension services, high cost of input (seeds), lack of quality control systems (Mpogole et al., 2012).

According to Tolno et al., (2016) poor organization along the chain characterized by informal relationships and poor co-ordination affects participation in value chains. There are no standard measures in place to ensure uniformity in weight, size or variety at the level of wholesale marketing. There is a tendency to mix young and mature potatoes, different sizes and varieties

and this greatly affects the quality. Traders charge higher prices for further sorting and grading for selected customers who emphasize quality.

Mpogole et al., (2012) found that access to credit and market participation were positively related. His results indicated that as access to credit increase by one unit, a farmers' chances to involve in the market increased by 7%. This was due to increase in technological investment and labour hence high production.

Hirpa et al., (2016) revealed that most Irish potato growing areas in Africa are characterized by poor infrastructure due to the geographical location. Poor infrastructure increases market cost such as, the cost of transport from area of surplus production to distant markets, where prices are higher. Inadequate infrastructure leads to the farmers not reaching the market. For instance, the farmers who are in the remote areas, it is difficult to bring their produce to the markets due to the lack of roads (Kato, 2015). Market infrastructure can be classified as hard (such as road) and soft (such as access to credit, extension services, marketing information, security, risk bearing and agricultural inputs (Mahlet et al., 2015). Lack of storage and processing facilities constrains marketability of perishable goods such as dairy products, fish, fruits and vegetables (Mugisha et al., 2010).

According to Hirpa et al., (2016) limited access to financing is a challenge to potato production, marketing and processing. All the actors on the value chain experience financial constraints because of collateral requirements and long loan application processes. As a result, actors primarily receive credit from informal credit sources such as village savings and loan associations (VSLAs), which charge higher interest rates and are less capitalized.

According to Bezabih et al., (2015) one cannot talk about value addition without considering the central and crucial role that energy plays. Uganda's cost of electricity versus affordability is

skewed. The unreliable power supply affects the value addition process immensely. There are cases in the countryside where electricity is unavailable for days without end. Such occurrences have forced processors to resort to the more expensive fossil fuel alternatives (Addisu et al., 2014).

According to Mpogole et al., (2012) Uganda is plagued by a poor transport network. While the road network seems to be in place reaching most of the habitable locations, there is a problem of its quality. The state of many countryside roads is so heartbreaking that it could take 3 hours for a journey that would ordinarily last 30 minutes. Due to the poor state of these roads, car breakdowns are rampant and this increases the cost of doing business for the middlemen. Depending on the potato product farmers are dealing in, such transport bottlenecks could lock out entire communities of farmers from value addition and market opportunities (MahletAbitew et al., 2015). Underdeveloped rural roads and other key physical infrastructure have led to high transport costs for agricultural products to the market as well as farm inputs reducing farmers' competitiveness.

Legal institutions influence the activities performed on the market and the costs of exchange. Abraham, (2013) affirmed that the formal institutional development of a society has a considerable influence on transaction costs. Effective legal institutions may improve the organization of the marketing channels and decrease marketing costs (Hirpa et al., 2016). In many developing countries, laws are not always executed and enforced correctly, bribery and cheating are often not penalized, courts are out of reach for the majority of the population, and market rules are often not transparent to the producers and traders (Gumataw et al., 2016). It is even worse for the smallholder farmers because they lack lobbies in the legal environment. As a result, rural trade prospers where trust has been developed based on repeated transactions or

informal relationships (Addisu et al., 2014). Thus, an unfavorable legal environment creates a significant barrier to entry into formal food trade and limits participation by smallholders in the marketing system (Netsayi et al., 2015).

Chapter Three: Research Methodology

This chapter discusses the design, area of study, study population, sample size, sampling technique, data collection methods and instruments, research procedure, data processing and analysis and ethical considerations.

3.1 Study Area

This study was conducted in Ndorwa County West, Kabale District. The major economic activity of the people in the county is agriculture with livestock and crop farming being the backbone of the area. Potato production is done by many households for food and income generation. The agro-climatic conditions in the area presents a favorable environment for potato production all the year.

The county has three potato growing seasons in a year: two in the rainy seasons (on hills, slopes and valley bottoms) and one in the dry season (in drained swamps). Normally the first season runs from mid-February to June. The second season, which is characterized by longer rains, starts from September through to November. In valleys and swamps the planting activities continue through December and January. The seasonality in production affects supply and prices. Usually, during the period from late August to early November, potato supplies are low and prices are high.

Average land holding is 2.5 acres, with almost 6 per cent of the total land under potato every year. Though there are several potato varieties in circulation, *Rwangume*, *Kinigye* (local varieties) and *Victoria* are the main varieties cultivated.

3.2 Research design

The study adopted cross sectional descriptive survey to value chain and smallholder farmers. The design was deemed appropriate in that it helped the researcher to gather information across various actors along the chain with an aim of describing events as they happen. The design adopted both quantitative and qualitative approaches for data collection and analysis. The qualitative approach was used in capturing respondent's views, feelings, knowledge and opinions on the subject matter using interviews while quantitative approach was used to capture quantifiable responses using questionnaire.

3.3 Study population

The study targeted potato value chain actors (such as; potato producers, input suppliers, commission men, rural hawkers, traders, wholesalers, retailers and consumers) and other key informants such as agricultural service providers. Potato producers and other chain actors were considered for their role in potato production, processing, marketing and movement from point to point. Agricultural service providers were being considered for their technical knowledge, advisory services and policy implementation.

3.4 Sample determination and size

From the UBOS report (2016) potato value chain actors make 16% of the total population in agriculture in Ndorwa County West. It was from this percentage that the researcher drew the sample size using standard statistical formula by Kish and Leslie, (1965) at 95% confidence interval and 5% error term as follows:

$$n = \frac{Z_{\alpha/2} Pq}{d^2} \text{ where } N > 10,000$$

$$n = \frac{1.96^2 \times 0.16 \times 0.84}{0.05^2}$$

$$= \frac{3.8416 \times 0.16 \times 0.84}{0.0025}$$

$$= \frac{0.5163}{0.0025}$$

$$n = 206 \text{ respondents}$$

n - The sample size

d - Degree of accuracy 0.05

p – Estimated number of value chain actors 16% (0.16)

q – Non- value chain actors 84% (0.84)

α – 0.05 (level of significance)

Table 3.1: Respondents categories

Respondent categories	Target number	Sampling method
Input suppliers	7	Simple random
Producers of potato	153	Simple random
Traders	10	Simple random
Processors	24	Simple random
Consumers	12	Simple random
Agricultural service providers	4	Purposive

3.5 Sampling Procedure and technique

The study employed mixed procedures in the selection of respondents. A stratified random sampling criterion was employed in the selection of respondents across the groups along the value chain. Stratified sampling involved the division of population into strata's or groups. In this case, value chain actors were divided into groups based on shared characteristics. The formed groups included, input suppliers, potato producers, traders, processors and consumers. It was from each group that a target sample was drawn using both random and purposive sampling techniques. In this case, a sample of (7) input suppliers, (153) potato producers, (10) traders, (24)

processors and (12) consumers was randomly selected from their respective groups with a help of random numbers. This was achieved by getting a list of respondents from each group with a help of their group leaders. On the other hand, non-probability (purposive) sampling method was used in the selection of agricultural service providers.

3.6 Data collection methods

The study used questionnaire and interview methods to gather primary data from the different respondent categories.

3.6.1 Questionnaire survey

A structured questionnaire that had both closed ended and open ended questions was designed and used to generate quantifiable information from different respondent categories including potato producers, input suppliers, rural hawkers, traders, wholesalers, retailers and consumers. The questionnaire was administered to the respondents by the researcher who aided in interpreting questions to the respondents in their local languages. The questionnaire was used to gather information on socio-demographic characteristics, potato actors, services and processes, socio-economic factors influencing small holders' participation in potato production and value addition, and institutional factors influencing small holders' participation in potato value addition.

3.6.2 Interview Guide

The researcher administered interviews to the key informants with a help of an interview guide reflecting the study objectives. With this method, the researcher engaged key respondents in oral

questions. The interviews were used widely to supplement and extend the researchers' knowledge about individual(s) thoughts, feelings and behaviors. While interviewing, probing was applied in cases where respondents did not give inadequate answers. This method was used to capture data from agricultural service providers and group leaders.

3.7 Research instruments

The study used self-administered questionnaires with (closed and open ended questions) and interview guide to collect primary data.

3.7.1 Questionnaire

A structured questionnaire with both (close and open ended questions) was designed, translated to the local language and then used to collect data from farmers. This method allowed different respondents categories (such as input suppliers, potato producers, traders, retailers, processors and consumers) to answer questions related to the study phenomenon. The questions answered in the questionnaire were in line with the study objectives. The questionnaires were administered by the researcher herself. Primary data was captured on;

Socio demographic characteristics like sex, age, education level, occupation, income status, source of income, landholdings, employment status, household size and access to extension services.

Potato value chain actors, services and processes in potato value chain at both national and local level

Socio-economic factors influencing farmers' participation in potato value addition

Institutional factors influencing farmers' participation in potato value addition



Figure 2: Briefing respondents about the purpose of research to respondents from Kamugangunzi

3.7.2 Interviews

Oral personal interviews that involved a face to face contact or conversation using an interview guide were used to capture opinions and views from key informants (such as; agricultural service providers and group leaders). Interviews helped in capturing supplementary information on the subject under investigation. Interviews also helped to generate first hand and reliable data. For the respondents who did not give immediate feedback, adequate probing was used to establish the specific information regarding the study phenomenon.



Figure 3: Interviewing some of the key informants from Kitumba Subcounty

3.8 Quality Control Methods

3.8.1 Content validity of instruments

According to Polit and Hungler (1995), validity refers to “the degree to which the instrument measures what it is supposed to be measuring”. Validity was ensured by examining the instruments. Before administering the questionnaire to the farmers, it was first examined by colleagues taking the same programme as the researcher. They were then scrutinized by the supervisor. This ensured that the terms used in the questionnaire were precisely defined and properly understood. The instrument was pilot tested on a population of 5 potato farmers outside the study population.

3.8.2 Reliability of Instruments

Reliability refers to the “degree at which the instrument consistently measures what it is measuring” (Wester camp, 2013). A number of measures were taken during field work, subsequent analysis and conclusion process in order to ensure the quality of the instrument. Before

actual collection of data, instruments were pre-tested on 5 - 10 respondents in one sub-county to determine reliability and these respondents were not part of interviewees. The reliability of the questionnaires in relation to the consistency of the respondents' answers was computed using the Cronback's Alpha Coefficient of over 0.70 was computed.

3.9 Ethical considerations

Ethical approval was obtained from the Research and Ethics Committee Bishop Stuart University, administrative authority was also sought from the respective leaders of Ndorwa County West before commencement of the study. A free and informed consent of each individual participant was obtained at the start of the study. Respondents read an informed consent form explaining; the purpose of the study, what participation in the study involved, how confidentiality and anonymity would be maintained, and the right to refuse to participate in the study or to withdraw from the study without any penalty, the benefits and risks of participating in the study. Personal / sensitive issues were only captured when rapport was established with some respondents. Respondents' culture was respected during data collection process. Confidentiality and anonymity was maintained by the use of code numbers on the questionnaire instead of respondents' names.

3.10 Data analysis

Data was analyzed using the two principal methods that were qualitatively and quantitatively.

3.10.1 Qualitative data analysis

Qualitative data was analyzed using thematic analysis. Qualitative data was translated and transcribed together with the taken notes during interviews. The analysis involved familiarization with the data through repeated readings of the transcripts and review of the audio files. The responses were noted down and the recordings transcribed according to the different groups of participants. Major themes were constructed depending on the most emerging responses from the different categories of groups. Key statements from the different themes were identified and these were used as quotations to reinforce results. The thematic approach allowed the researcher to use a mixture of deductive and inductive analysis.

3.10.2 Quantitative data analysis

Quantitative data from questionnaires was collaborated during data analysis. Data collected was coded, entered and cleaned using the excel computer program which was later exported to Statistical package for social scientists (SPSS), Version 16.0 for analysis. Both descriptive and inferential statistics were generated and used in interpreting results. Continuous variables (age in years, education in years, acreage, and quantity harvested) were analyzed using mean, variance and standard deviation while frequencies and percentages were applied on categorical variables (such as; gender, marital status, source of livelihood etc.). Multivariate analysis using correlations and regression statistics was performed to assess the possible associations between

the dependent and independent variables and significant relations with the dependent variables. Data outputs were presented in tables, pie-charts and graphs.

Objective one was to identify actors, services and processes in the standard potato value chain at both national and local level. Review of documents and online publications were used to generate and analyze information on this objective. Key information was generated from the district Production department, farmer group leaders, traders and processors. Descriptive and thematic analysis was performed to make comparisons between national and county level value chain actors.

Objective two was to establish the socio-economic factors influencing small holder farmers' participation in potato value addition in Ndorwa County west. Objective three was to establish the institutional factors influencing small holder farmers' participation in potato value addition in Ndorwa County west.

Objectives 2 and 3 were analyzed using a logistic regression model where the dependent variable was probability of participation in the potato value chain. The independent variables included; labor, land, capital, education level, experience, volume of production, distance to markets, improved technology, age, sex, and household size as socio economic factors, and input supply, access to financial/ credit services, poor organization along the chain, transport issues, legal environment, lack of organized markets, inadequate infrastructure, un-reliable sources of power, fall in price of ware potatoes, access to extension service, value addition information, lack of formal arrangements along the chain as institutional factors hypothesized to influence small holder farmer participation in potato production and value addition. Binary logistic regression was used because it is the model that used to predict the chances of an event happening.

Analysis of Objective two

A binary logistic model for analysis was specified as below;

$$\log(p / 1 - p) = \alpha + b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n + e \dots \dots \dots 3.2$$

Where; p = is the probability of participation in the potato value chain

α = is the coefficient on the constant term

$b_1 \dots b_3$ = is the coefficient(s) on the independent variable(s)

$X_1 \dots X_2$ = is the independent variable (such as; labor, land, capital, education level, experience, volume of production, distance to markets, improved technology, age, sex, and household quantity harvested, engagement in off farm activities, membership in farmer group).

Analysis of objective three

A binary logistic model for analysis was specified as below;

$$\log(p / 1 - p) = \alpha + b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n + e \dots \dots \dots 3.2$$

Where; p = is the probability of participation in the potato value chain

α = is the coefficient on the constant term

$b_1 \dots b_3$ = is the coefficient(s) on the independent variable(s)

$X_1 \dots X_2$ = is the independent variable (such as; input supply, access to financial/ credit services, transport issues, lack of organized markets, inadequate infrastructure, un-reliable sources of power, fall in price of ware potatoes, access to extension service, legal environment, value addition information, and lack of formal arrangements along the chain).

e = is the error term

Chapter Four: Results

This chapter presents the analysis and interpretation of the results obtained from the field.

4.1 Socio-economic characteristics of potato farmers

This sub-section presents the demographic features of 206 sampled respondents. The key demographic characteristics captured for the study included; gender, age, education level, marital status, household size, total farm size in acres. These features were found to be of great help in terms of clearly depicting the diverse background of potato value chain actors.

Table 1: Socio-economic characteristics of potato farmers

Household Characteristics	Total (n=206)
<i>Gender of respondents (%)</i>	
Female	107 (51.9%)
Male	99 (48.1%)
Age in years (mean)	37.03 ± 8.233
<i>Marital status (%)</i>	
Never married	53 (25.7%)
Married	109 (52.9%)
Separated	19 (9.2%)
Widow	25 (12.1%)
Education level in years (<i>mean ± Std. D</i>)	10.80 ± 3.321
Household size (<i>mean ± Std. D</i>)	5.02 ± 2.168
Total farm size in acres (<i>mean ± Std. D</i>)	3.05 ± 2.235
<i>Source of livelihood (%)</i>	
Farming	150 (72.6%)
Business	30 (14.8%)
Formal Employment	26 (12.6%)

The survey results in table 1 showed that 51.9% and 48.1% of the respondents were female and male, respectively. The participation of more females than males was reflected on the potato sector which has attracted more females than men. Mean age of the respondents were 37 years with the youngest aged 20 and the oldest 89 years. Moreover, 52.9% of the sample respondents were married, 25.7% single, while 12.1% and 9.2% were widowed and separated, respectively.

The average number of years spent in school was 10 with a minimum of zero and a maximum of 18. An average family was made of 5 members. This average made differences in family size, where the largest family had 11 members and the smallest 3. Average land holdings were 3 acres with a minimum of an acre and largest holder owning 06 acres. 62.6% of the respondents depended on farming for livelihood, 24.8% on small scale petty business while 12.6% depended on salary.

Table 2: Potato production

Production information	Total (n=206)
<i>Variety of potato grown</i>	
Victoria	38 (18.5%)
Rwangume	101 (53.9%)
Kinigye	67 (32.5%)
<i>Source of seed inputs</i>	
Government	13 (6.3%)
Self	118 (57.3%)
Fellow farmers	63 (30.6%)
NGOs	12 (5.8%)
<i>Motive behind potato production</i>	
Food	45 (21.8%)
Income	70 (33.9%)
Both food and income	91 (44.2%)

Ninety six point one (96.1%) of the respondents agreed to growing potato while 3.9% said they did not grow potato but they dealt in other potato value chain activities. Majority of the potato growers (53.9%) grew *Rwangume* variety, (32.5%) grew *Kinigye* and 18.5% grew *Victoria*. Of the respondents, 57.3% obtained seed inputs through seasonal seed multiplication, 30.6% from fellow farmers, 6.3% from government agencies(NARO) and 5.8% Non-Government Organizations (NGOs). 44.2% of the respondents grew potato for both food and income while 33.9% and 21.8% were into potato for income and food respectively. In an interview with one of the potato producers, he revealed;

“.....farmers in this area grow different varieties of Irish potato but the commonly grown varieties are Victoria, Rwangume and Kinigye. This is because of their high profit returns and easy access to seed inputs mainly from fellow farmers”.

4.3 Actors, services and processes in a standard potato value chain

This section of the study addressed research question one which sought to identify actors, services and processes in a standard potato value chain and compare with the value chain in Ndorwa County West. The gathered information was analyzed using both qualitative and quantitative approaches as below;

4.3.1 Potato value chain actors

Table 3: Potato value chain actors

Respondent category	Total (n=206)
Input suppliers	7 (3.4%)
Producers	153 (74.3%)
Traders	10 (4.8%)
Processors	24 (11.6%)
Consumers	12 (5.8%)
Total	(100%)

Results presented in table 3 above indicate that the majority (74.3%) of the respondents were producers (potato growers), 11.6% processors, 5.8% consumers, 4.8% traders and only 3.4% consumers.

4.3.2 Potato value chain services

Table 4: Potato value chain services

Value chain services	Total (n=206)
Credit provision	32 (15.5%)
Value addition	40 (19.4%)
Advisory services	34 (16.5%)
Education and training	20 (9.7%)
Processing	37 (17.9%)
Research and development	30 (14.6%)
Technology and innovation	13 (6.3%)
Total	100.0

Results on potato value chain services and processes captured and categorized as presented in table 4 above. Most (19.4%) of the respondents knew about value addition as a service along the potato value chain that was done by groups of farmers trained by NGOs like IFDC, Self Help Africa and Excel Hort. Consult Limited, 17.9% processing into crisps and chips done by respondents on small scale and on a large scale into crisps by UIRI, 16.5% extension and advisory services, 15.5% Credit provision and value chain finance mainly through farmer group savings, VSLAs and SACCOs, 14.6% of the respondents indicated that research and development was done by the regional ZARDI , 9.7% have had education and training and 6.3% reported that they were engaged in technology and innovation.

4.3.3 Comparison between potato value chain at local level with standard potato value chain

The potato value chain was developed based on information gathered during interview with the key informants of the study. Based on the information gathered, the responses have been developed to graphically present all the actors in the value chain. In potato production and marketing, there are several actors involved in the value chain e.g. input suppliers, farmers,

processors, traders, exporters and retailers etc. The chain represent the overall market position where growers, traders, suppliers, processors are present (Figure 4.1). The accumulative roles of various actors constitute the pillars of the potato value chain, because their presence or absence has important implications on the production and marketing of the crop. Potato markets are largely dominated by traders and wholesalers while farmers are always at a relatively disadvantaged position. The chain of actors through which the transactions take place between producer and consumer plays an important role in achieving the marketing objectives of the produce.

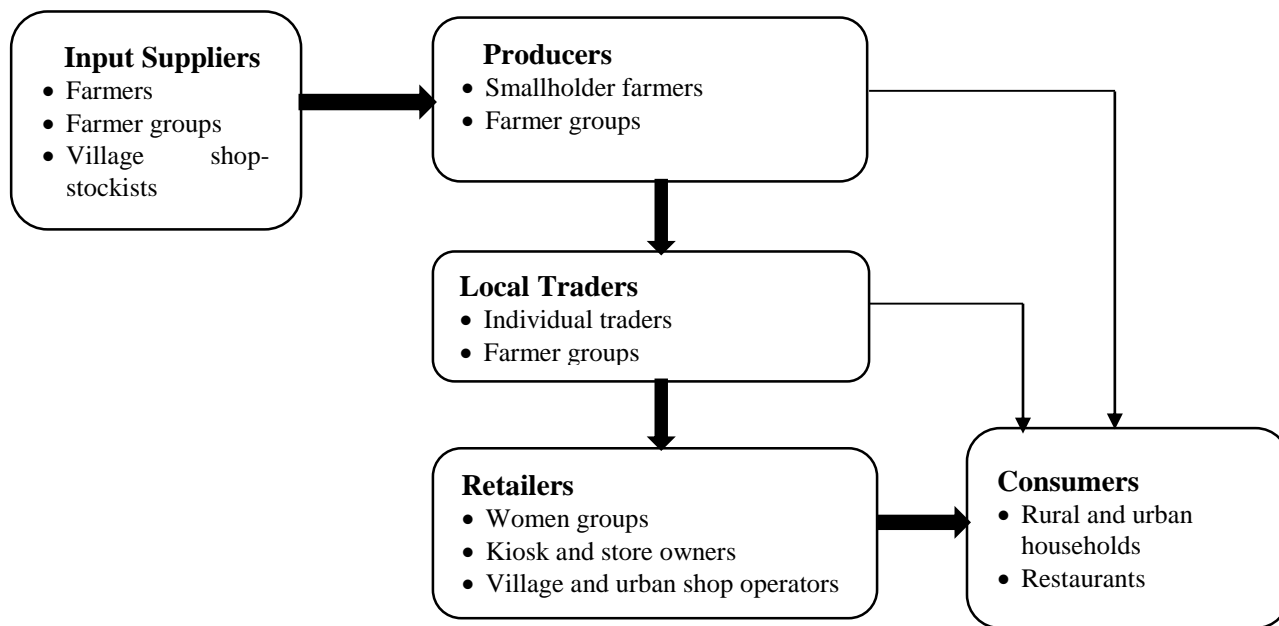


Figure 4: Potato value chain in Ndorwa County West

According to figure 2 above, the potato value chain in Ndorwa County West comprise of five main categories of actors (input suppliers, producers, local traders, retailers and consumers). The study revealed that these chain actors play different roles in the movement of potato from the point of production to consumption. Input suppliers mainly provide inputs (i.e. seed, fertilizer, pesticides, herbicides and farm tools) and advisory services on input use especially on dosage.

Producers help in production activities like land preparation, planting, fertilizer application, weeding, pest and disease control and post-harvest management. Producers sell their produce to local traders who later sell to retailers. However producers also sell in the retail markets(both urban and Local) directly to consumers and in most cases producers especially those operating on small scale sell directly to rural consumers.

Local or village traders operate as individuals or in groups. These procure potatoes from farmer's field and move it to collection stores. Local traders purchase potatoes from different rural producer premises and transport the lot to the commission agents.

The main consumers in potato value chain of Ndorwa County West include rural and urban households, restaurants and hotels. The consumers in general buy potatoes from urban and rural retail markets. At times consumers buy from producers directly depending on the quantity demanded.

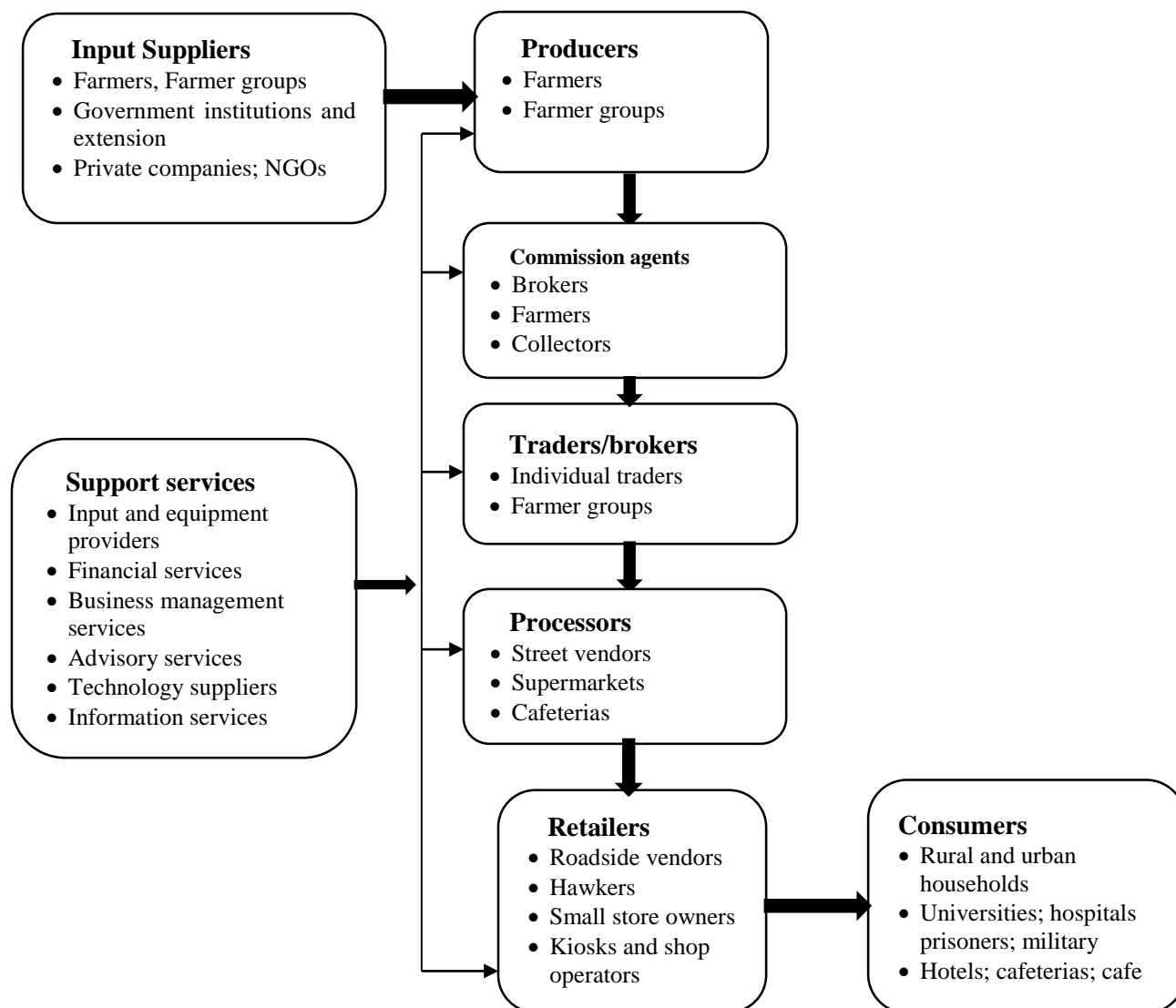


Figure 5: Standard potato value chain

Input suppliers supply potato farmers with seed input. However, majority use their home saved seed stored from previous seasons. In terms of fertilizer use, a big number of farmers use only organic fertilizer (manure and compost) while some farmers solely depend on inorganic and organic fertilizers depending on the size of land allocated to potato and soil fertility status perceived by the farmers. Producers obtain fertilizer, agrochemicals and farm tools from either SACCO or private traders.

Potato producers; the next major potato value chain actors following input suppliers are potato growers. They are generally smallholder farmers having an average land size of 2.5 acres. Potato production is based on rain-fed system. Producers are the major actors who perform most of the value chain functions right from input procurement to post harvest handling and marketing. The major value chain functions that potato growers perform include ploughing, ridging, planting; fertilization, weeding, pest and disease control, harvesting and post-harvest handling. Potato sole cropping is the most popularly practiced production system across the region. Farmers also occasionally intercrop potato with other crops like beans. Post-harvest handling, which includes different activities like sorting, grading, packing, storing, transportation, loading and offloading, is done by the farmers themselves or traders or brokers.



Figure 6 Farmers (producers) preparing land for planting potatoes

Traders; these play a crucial role in potato marketing system of Uganda by facilitating potato transaction by linking producers with traders, and consumers. The role of traders in potato selling cannot be underrated. Traders sometimes go beyond facilitation of transaction and tend to control and fix prices, create price symmetry and make extra benefits from the process. Potato traders in Ndoorwa west like many parts of the country work in unregulated and informal way

Potato processors; potato is commonly consumed in the form of boiled and cooked meals in different traditional dishes. Recently, consuming potato chips, crisps, and roasted potato are becoming common practices especially in cities and urban centers. In urban areas it is also usually consumed mixed with other vegetables as salad. Medium scale potato processing is done by UIRI in Uganda which has a branch in Kabale. Few processors of mainly chips were interviewed during the survey although they could not tell about the volume of potato processed as the product is sold mixed with different products like vegetables. Hence, it is hardly possible to report on the volume of potato processed in the study area. Those few processors interviewed said that they prefer large size potato for processing.

Potato retailers; these are key actors in potato value chain. They are the last link between producers and consumers. They mostly buy from producers and sell to urban consumers. Consumers usually buy the product from retailers as they offer according to requirement and purchasing power of the buyers. Retailers always keep small amount of potato compared to other traders.

Consumers; about four types of potato consumers were identified: households, restaurants/hotels, cafés, and higher education institutions. The overall the per capita potato consumption is estimated at 33 kg and 17 kg at peak (7 months) and slack (5 months) seasons respectively for all consumer types making the average annual per capita consumption about 50 kg. Peak season of potato consumption coincides with the harvest time and the slack season is when potato from local supply declines. Higher institutes provided higher demand for potato since the students prefer chips. Consumers prefer big potato with smooth skin and free from damage. Restaurants, hotels and higher institutes prefer bigger potato size whereas households prefer medium size potato.

Potato support service providers; these service providers are essential for value chain development and include sector specific input and equipment providers, financial services, business management services, and market information access and dissemination, technology suppliers, advisory service, etc. Some service providers extend service beyond one function and others are limited to a specific function. For instance, agriculture offices provide service at production and post-harvest handling levels whereas NGOs participate in input supply, production and processing levels.

4.4 Socio-economic factors influencing participation in potato production and value addition

This section of the study addresses the socio-economic factors limiting small holder farmers' participation in potato production and value addition in Ndorwa County west. A logistic regression model was used to predict the factors that influenced participation in potato production and value addition as in table 5 below.

Table 5: Socio-economic factors influencing small holder farmer's participation in potato value addition

Socio-economic factors	AOR (95% CI)	p-value
Age	0.987 (0.955 - 1.020)	0.831
Educational level	1.009 (0.932 - 1.091)	0.435
Gender	2.685 (0.507 - 4.782)	0.000*
Income status of the household	1.419 (0.462 - 4.362)	0.541
Access to capital	0.384 (0.169 - .871)	0.047*
Knowledge on value addition technologies	0.717 (0.447 - 1.151)	0.168
Access to technology	1.459 (0.883 - 2.412)	0.041**
Lack of storage facilities	0.156 (0.068 - 1.608)	0.864
Household size	1.342 (0.145 - 2.808)	0.002**
Quantity harvested	0.588 (0.367 - 1.940)	0.042*
Engagement in off farm activities	0.898 (0.806 - 1.001)	0.026**
Membership in farmer group	2.569 (0.239 - 5.327)	0.001**

Dependent variable: Participation in potato production and value addition

*, **, *** statistically significant at 10%, 5% and 1% significance level

AOR → Adjusted Odds Ratio

- CI → Confidence Interval

Results of the logistic regression model of smallholder farmer participation in potato production and value addition in relation to socio-demographic factors were presented in table 5. The odds ratios explained the probability changes in the outcome as a result of a unit change in the explanatory variables. Twelve factors were hypothesized and seven presented a significant association with the outcome variable.

Gender increased the chances of the probability of a farmer participating in potato production and value addition by 2.685. Male farmers were 2.6 times likely to participate in potato production and value addition compared to their female counterparts [AOR = 2.685; (95% CI: 0.507 - 4.782); p = 0.000]. In an interview with an extension officer, he revealed;

“.....men compared to women have more chances participating in potato production and value addition. This is because of the African tradition culture which gives men more powers to own land and control technological resources than women. Therefore it is no doubt that men would participate in potato production and value addition than women”.

Contrarily to gender, lack of access to capital reduced the log odds of the probability of smallholder farmers participating in potato production and value addition by 0.384. Farmers with limited capital were 0.4 times less likely to participate in potato production and value addition compared to those with capital to invest [AOR = 0.384; (95% CI: 0.169 - 0.871); p = 0.047]. In an interview with one of the traders, he stated;

“.....in spite of the importance of financial institutions to farmers, and other chain actors, only a few farmers and traders access agricultural credit. Financial institutions are not accessible to value chain players because it is difficult to deal with them mainly due to lack of adequate collateral, high incidence of default and administrative costs associated with management of small loans”.

Access to technology presented a significant association with smallholder farmers' participation in potato production and value addition and was statistically significant at 5%. Farmers with access to production and value adding technology were 1.5 times more likely to participate in potato production and value addition activities compared to those with no access to technology [AOR = 1.459; (95% CI: 0.883 - 2.412); p = .041]. In an interview with one of the extension staff, she revealed;

“.....technology is key in both potato production and value addition. However high poverty levels in this area limits many potato players from acquiring the rightful technology for value addition”.

Household size (labour) increased the chances of the probability of smallholder farmers' participation in potato production and value addition by 1.342. Bigger households were 1.3 times more likely to involve in potato production and value addition activities compared to small households [AOR = 1.342; (95% CI: 0.145 - 2.808p = 0.002]. This is because of the increase in labour required to take on activities. In an interview with one of the local council chairpersons, he stated;

“.....harvesting of Irish potato is more laborious, time consuming and expensive because the work is done manually by using a hand hoe in order to avoid damaging of the crop. Most farmers in the area depend on family labour only as their main source of labour for Irish

potato production. The use of family members in farming activities is very common due to farmers' low income. Therefore, family labour is used to reduce production and value addition costs”.



Figure 7: Harvesting of irish potatoes from Ryakarimira Town Council

Quantity harvested reduced the log odds of the likelihood of smallholder farmers participating in potato value addition by 0.588. The smaller the quantity harvested, was associated with reduced chances of adding value [AOR = 0.588; (95% CI: 0.367 - 1.940); p = 0.042] since all the harvest was rather considered for consumption. In an interview with one of the extension agents, he said;

“.....sometimes the quantity harvested by farmers is small reducing their chances of participating in potato value addition. With an average yield of 1.5 tones/ha in a season, this yield is mainly kept for home consumption. The low yield is as a result of many reasons including, low levels of application of farm inputs, planting time (early or late), and soil fertility, type of seeds used and ability to control pests and diseases”.



Figure 8: Value addition through sorting and grading by farmers from Butanda sub county

Availability and engagement in off farm activities decreased the log of the probability of smallholder farmers' participation in potato production and value addition by 0.898 and this was statistically significant at 5%. Smallholder farmers engaged in off farm income generating activities were 0.89 times less likely to participate in potato production and value addition compared to those not engaged in off farm activities [AOR = 0.898; (95% CI: 0.806 - 1.001); p = 0.026]. The earlier stated null hypothesis of no association between off farm activities potato production and value chain participation was in this case rejected.

Being a member of a farmers' group increased the log of the probability of smallholder participation in potato production and value addition by 2.569. Smallholder farmers who belonged to a group were 2.6 times more likely to participate in potato value addition than those who never belonged to a group [AOR = 2.569; (95% CI: 0.239 - 5.327); p = 0.001]. During an interview with an agricultural extension worker, he revealed;

“.....Membership to a farmer organization is an important source of information among farmers. Farmers can get information about the use of modern/ improved technologies and good agricultural practices through group membership hence, improvement in production and chances of adding value. Farmers' associations are also important in increasing bargaining power on the selling prices of crops”.

4.5 Institutional factors influencing participation in potato value addition

This section of the study addresses the institutional factors limiting small holder farmers' participation in potato value addition in Ndorwa County west. The association between participation in potato production and value addition in relation to institutional factors was evaluated using binary logistic regression as in table 6 below.

Table 6: Institutional factors influencing small holder farmers' participation in potato value addition

Variables	AOR (95% CI)	p-value
Access to credit services	2.808 (0.319 - 5.978)	0.002**
Lack of organized markets	0.789 (0.113 - 2.116)	0.039**
Inadequate infrastructure	0.871 (0.229 - 3.309)	0.839
Un-reliable sources of power	0.121 (0.226 - 2.566)	0.004**
Fall in price of ware potatoes	1.025 (0.885 - 1.187)	0.742
Access to extension service	1.603 (0.390 - 3.933)	0.023**
Lack of clear legal environment	1.364 (0.863 - 2.153)	0.183
Value addition information	0.936 (0.468 - 1.158)	0.015**
Lack of formal arrangements along the chain	0.493 (0.275 - 0.887)	0.018*

a. Dependent variable: Participation in potato production and value addition

*, **, *** statistically significant at 10%, 5% and 1% significance level

- AOR → Adjusted Odds Ratio
- CI → Confidence Interval

The results of the analysis were presented in table 6. The odds ratios explained the changes in the outcome resulting from the change in each of the explanatory variables. Nine factors were hypothesized and only six presented a significant association with the outcome variable.

Access to credit services presented a significant association with smallholder participation in potato production and value addition. Credit access increased the chances of participation in potato production and value addition by 2.8. Farmers with access to credit/financial services had 2.8 chances of involving in production and value addition that those without access [AOR = 2.808; (95% CI: 0.319 - 5.978); p = 0.002]. In an interview with one of the traders, he stated;

“.....in spite of the importance of financial institutions to farmers, and other chain actors, only a few farmers and traders access agricultural credit. Financial institutions are not accessible to value chain players because it is difficult to deal with them mainly due to lack of adequate collateral security, high incidence of default and administrative costs associated with management of small loans”.

Lack of organized markets decreased the log odds of chances of smallholder participation in potato production and value addition by 0.8 and this was significant at 5%. The more the markets were disorganized, the lesser farmers were likely to participate in production and value addition [AOR = 0.789; (95% CI: 0.113 - 2.116); p = 0.039]. In an interview with one of the traders, he stated;

“.....potato trade in Ndorwa West County is totally disorganized, each player operates on their own and within their limits. There are no formal sources of information, potato prices change every now and then which promotes cheating amongst the players along the chain”.

Like disorganized markets, power shortage and load shading decreased the log odds of chances of smallholder participation in potato value addition by 0.121 and this was significant at 5%. The more power sources were unreliable, the lesser it was for farmers to participate in potato value addition [AOR = 0.121; (95% CI: 0.226 - 2.566); p = 0.004]. In an interview with one of the processors, he stated;

“.....Ndorwa West County is blessed with conducive climate that favors Irish potato production. However value addition is mainly affected by unstable power supply. Like any other part in Kabale district, electricity is always on and off there by affecting potato processing given that some specific machines used in processing like boilers and micro-waves require power to operate”.

Access to extension service displayed a positive significant association with smallholder farmers' participation in potato production and value addition by 1.6. Farmers who had regular contacts with extension agents had 1.6 chances of participating in potato production and value addition compared to those who never had contacts [AOR = 1.603; (95% CI: 0.390 - 3.933); p = 0.023]. In an interview with an extension agent, he said;

“.....extension officers have important role in giving farmers advice on the proper use of inputs, good methods of farming as well as knowledge on value addition. Therefore it is no doubt that farmers who have regular contacts with extension agents may participate in potato production and value addition as a sign of experimenting the knowledge acquired”.



Figure 9: Extension worker from Kitumba Subcounty demonstrating on planting and fertilizer use.

Lack of access to value addition information reduced the log odds of smallholder farmers' participation in potato production and value addition by 0.936 and this was significant at 5%. Farmers without access to value addition information were 0.9 times less likely to participate in value addition compared to those with information access [AOR = 0.936; (95% CI: 0.468 - 1.158); $p = 0.015$]. In another interview with an extension agent, he said;

“.....due to the remoteness of the area, farmers hardly access production and value addition information. They instead rely on poor information channels like fellow farmers who are always unreliable”.

Lack of formal arrangements along the chain reduced the log odds of smallholder farmers' participation in potato production and value addition by 0.493 and was significant at 10%. The more the chain was not organized, the lesser the chances that farmers would participate in and value addition and vice vasa [AOR = 0.493; (95% CI: 0.275 - 0.887); $p = 0.018$].

Chapter Five

Discussions, Conclusions and Recommendations

5.0 Discussion

This chapter discusses the findings, draws conclusions and makes recommendations based on the study findings. The section further provides the areas that are suggested for further research

5.1 Actors, services and processes in a standard potato value chain as compared with the local value chain

The standard value chain map in this study highlighted the involvement of diverse actors who participated directly or indirectly in the value chain. The study classified value chain actors in the potato sector as direct and indirect. Direct actors were commercially involved in the chain (input suppliers, producers, processors, traders, retailers, consumers) and indirect actors provided financial or non-financial services or supported the functioning of value chain (bankers and credit agencies, business service providers, government, researchers and extension agents).

The study identified different actors involved in potato value chain in Ndorwa County West. Unlike the standard value chain at national level (comprising of producers, commission agents, local traders, wholesalers, processors, retailers and consumers), the potato value chain in Ndorwa County West had the following categories of actors; input suppliers, producers, local traders, retailers and consumers. These chain actors performed different roles in the movement of potato from the point of production to consumption. The standard potato value chain was longer (has

many categories of actors) and the potato value chain at local level i.e. Ndorwa County West had fewer actors along the value chain. The implication is that in Ndorwa County West, some sections of the value chain are not available and so farmers have fewer opportunities for participation in the value chain. Since these chain actors perform different roles in the potato value chain (from pre-planting operations through production up to final consumption) some of their roles and services will not be exploited by farmers in Ndorwa County west.

The major input suppliers in the area are in private sector (individual stockists, smallholder farmers, farmer groups and cooperatives) who aim at maximizing profits. These provide inputs like seed, fertilizers, pesticides, farm tools and at times on credit to the farmers. This study finding is comparable to Upadhyay, (2011) who alleged that seed multipliers in this chain are private individual suppliers and potato based cooperatives. These multiply potato seed and sell them to the producers who are members and other interested growers.

Producers are the next major actors who perform most of the value chain functions starting from mobilizing inputs to post-harvest handling and marketing. With an average land holding size of about

2.5 hectare, most producers act as an individual with un-exception of a few producer groups that were newly established.

The major value chain activities that producers perform include; land preparation, planting, fertilizer application, weeding, pest and disease control and post-harvest management. There was an observed variation in production by gender where males are more involved in the production than females. This study finding is in agreement to findings by Mahlet Abitew et al., (2015) who cited that potato growers are the major actors who perform most of the value chain

functions right from farm inputs preparation on their farms or procurement of the inputs from other sources to post harvest handling and marketing.

. Traders are the major actors in local potato trade. They buy potatoes from farmers' field and move it to collection stores. They also carryout activities like sorting, packing and transporting to the next destination market. Traders mainly operate as individuals who buy fresh potato, stock and later transport it to the next destination. They play a leading role in collecting and distributing fresh potato from producers to alternative markets. This is in line with Wasukira et al., (2014) who cited that traders serve as potato buyers as well as raw input suppliers. They are somewhat strong financially as well as management know how in all aspects of the business activity as compared to other actors of this value chain. They purchase potato from producers directly or through commission men.

Retailers included women groups, kiosk and store owners, village roadside sellers, supermarkets, village and urban shop operators. They are actors who sell potato in small quantities as per the consumer's requirements. In urban areas, market retailers buy 1-5 bags from brokers and then sell them in heaps of various sizes and grades for amounts ranging from US\$100 to US\$ 2,000 per heap. Retailers' activities in potato marketing system include buying, transporting to retail areas, and selling to consumers. This study finding is in line with Sebatta et al., (2014) who argued that retailers get products from farmers and transporters and then sell the product to the final consumer with or without any modification in the product.

Consumers are end users of potato and its products in the value chain. Consumers purchase potato directly from retailers though on some occasions they purchase from producers, traders, and processors. They consume both local and improved varieties. The main potato consumers included households, hotels/ restaurants and education and other institutions. This study finding

is in line with Sebatta et al., (2014) who argued that consumers are end users of potato in the value chain. They are composed of three groups: The first group buys the potato from the producers and made some preparation for final consumption. These include the people who live near the producers and the workers who are working in the offices. The second group buys the potato from the hotel which is ready to eat. The last group buys potato from open market for final use after making some preparation.

The main value chain support services included input and equipment providers, financial services, business management services, market information access and dissemination, technology suppliers, and advisory service. The services are provided by various actors who never directly deal with the product, but whose services add value to the product. The study discovered many institutions supporting the potato value chain. The most common support providers are agricultural offices, private companies; research centers, traders, cooperative and, universities. These findings are in line with Sebatta et al., (2014) who cited that support service providers are essential for value chain development and include sector specific input and equipment providers, financial services, business management services, and market information access and dissemination, technology suppliers, advisory service, etc.

5.2 Socio-economic factors influencing participation in potato value addition

The study discovered different significant socio-economic factors limiting smallholder farmers' participation in potato production and value addition in Ndorwa County west. Seven of the twelve hypothesized factors had a significant association with the outcome variable.

Lack of access to capital reduced the log odds of the probability of smallholder farmers participating in potato production and value addition. Income plays a significant role in the

purchase and access to farm inputs which are key production and value addition factors. Farmers with limited capital were less likely to involve in potato production and value addition compared to their counterparts. This is because production and value addition require a lot of investment in terms of management and technology of which poor households may not be able to afford. These study findings concur with Byarugaba and Imelda, (2013) who revealed that value chain actors lack capital to take on some of the new technologies such as improved packaging material, inputs and processing facilities.

Gender increased the probability of smallholder participation in potato production and value addition by 2.685. Compared to females, male farmers were 2.6 times likely to participate in production and value addition. This is because male actors are more active on potato value chain nodes of trading and processing than their female counterparts. The value chain nodes of production and consumption are on the other hand dominated by female actors. Males are largely involved in the value chain nodes of production, trade, and consumption. This study finding is in line with Hirpa et al., (2016) who argued that gender and educational status have a significant effect on whether or not a farmer participates in the potato market and his/her choice of a market channel.

Quantity harvested acted as a factor to smallholder farmer participation in potato production and value addition. Smaller quantities harvested reduced chances of adding value among farmers. The result of the study showed that a unit decrease in the quantity of potato produced has decreased the quantity supplied on market hence the chances of adding value. This is on contrarily with results by Netsayi et al., (2015) who confirmed that the total amount of potato produced and supplied on the market had a statistically significant relationship. Farmers who

produced more amount of potato per hectare supplied more potato to the market than those who produced low amount of potato.

Household size (labour) had a significant influence on smallholder participation in potato production and value addition. Bigger households were 1.3 times more likely to involve in potato production and value addition activities compared to small households. Household size as a proxy for labour indicates the importance of family labour in smallholder agricultural production and value addition. This means the larger the family size, the higher the probability of labour force availability and consequently the higher the productivity. This is in consistent with a study by Addisu et al., (2014) which found that households with many members tended to be more reliant on traditional vegetables. Farmers depend on the family as an immediate source of the labour. The larger the family the more the available labour force and consequently more productivity is expected to meet their food needs.

Engagement in off farm activities decreased the probability of smallholder participation in potato production and value addition. Farmers engaged in off farm income generating activities were less likely to participate in potato production and value addition. This is because engagement in off-farm activities may limit time available to engage in on-farm activities. On the other hand, engagement of households in off farm activities may have positive influence on potato production and value addition. Off farm activities may be a source of additional income which enables farmers to invest in agricultural activities resulting in increased production and per capita value added. The findings agreed with a study by Netsayi et al., (2015) who showed that there was high diversification and strong interactions among agricultural activities and off-farm activities in smallholder farmers' production systems. Non-farm activities enable households to

obtain additional income, empower themselves financially and diversify their agricultural production.

Farmer group membership had a significant influence on smallholder involvement in potato production and value addition. Farmers who belonged to groups were times more likely to participate in potato value addition than those who operate as individuals. This is because farmer organizations are critical in improving access to agricultural inputs, technology, information and output markets in the potato sector. The findings are in agreement with a study by Byamugisha, (2014) which established that social networks played an important role in agricultural production. Group membership enhanced farmers' ability to access inputs cheaply and to bargain for better prices. Members of producer groups had better access to technical advice on crop management which helped them increase their yields.

5.3 Institutional factors influencing participation in potato value addition

The study identified different significant institutional factors limiting smallholder farmers' participation in potato production and value in Ndorwa County west. Nine factors were hypothesized and only six presented a significant association with the outcome variable.

Lack of access to value addition information was a significant barrier to farmers' participation in potato production and value addition. Farmers without good access to value addition information were less likely to participate in value addition compared to those with information access. This is in agreement with a study by Sapkota and Bajracharya, (2018) who also discovered that majority of the market actors had limited or no access to reliable information about the potato market regarding prices, volumes, demand market opportunities and prospects. The brokers

instead controlled the flow of market information, especially concerning market opportunities, making it difficult for other actors to penetrate better markets.

Un-organized markets decreased the chances of smallholder farmers participating in potato production and value addition by 0.8. The more the markets were disorganized, the lesser farmers were likely to participate in production and value addition. Lack of organized market and storage affects farmers, traders and processors. Storage facilities are crucial in addressing the challenge of seasonality and price fluctuations, both of which affect profit margins at all levels of the potato value chain. This finding is comparable to the findings by Tolno et al., (2016) who revealed that the potato chain is characterized by informal relationships and poor co-ordination and organization. There are no standard measures in place to ensure uniformity in weight, size or variety at the level of wholesale marketing. There is a tendency to mix young and mature potatoes, different sizes and varieties and this greatly affects the quality. Traders charge higher prices for further sorting and grading for selected customers who emphasize quality.

Access to credit services presented a significant association with smallholder participation in potato value addition. Credit access increased the chances of small holder farmers' participation in potato production and value addition and vice versa. Therefore, limited access to credit acts as a challenge to potato production, value addition and marketing. Given the rain-fed nature of the agriculture sector in the area, many financial institutions find it difficult to give out loans to farmers in fear of the risks. Even those willing to give loans to farmers have complicated loan terms that most farmers may not satisfy like security, payback period, etc. Lack of finance, therefore, limits the farmer's capacity to invest in production and value adding technology. This study finding is in agreement with Mpogole et al., (2012) who also stated that credit access and market participation are positively related. His results indicated that as access to credit increase

by one unit, a farmers' chances to involve in the market increased by 7%. This was due to increase in technological investment and labour hence high production.

Access to extension service displayed a positive significant association with smallholder participation in potato production and value addition by 1.6. Farmers who had regular contacts with extension agents had 1.6 chances of participating in potato production and value addition compared to those who never had contacts. This is in line with a study by Hirpa et al., (2016) which stated that agricultural extension services provided by agricultural officer are an important source of information about improved agricultural technologies.

Power shortage and load shading reduced the chances of smallholder participation in potato value addition. One cannot talk about value addition without considering the central and crucial role energy plays. The areas cost of electricity versus affordability is totally skewed. The unreliable power supply affects the value addition process immensely. There were reported cases where electricity is unavailable for days without end. Such occurrences forced processors to resort to the more expensive fossil fuel alternatives. This finding concurs with findings by Bezabih et al., (2015) who argued that unreliable power supply affects the value addition process on various vegetables especially those that require power for processing.

5.4 Summary of the findings

The study was making an assessment of the factors influencing small holder farmers' participation in Irish potato value addition in Ndorwa County West, Kabale District. The specific objectives were to; identify actors, services and processes in a standard potato value chain as compared with the value chain in Ndorwa County, establish the socio-economic and institutional factors influencing small holder farmers' participation in potato production and value addition.

The study was a cross sectional descriptive survey employing both qualitative and quantitative approaches of data collection and analysis. Data was collected from 206 smallholder farmers and other value chain using questionnaire and interviews. Data management and analysis was done using SPSS version 20 to generate both descriptive and regression statistics. The study discovered a difference in term of actors, services and process in the potato value chain of Ndorwa County West compared to a standard potato value chain. Unlike the standard value chain at national level, the potato value chain in Ndorwa County was generally classified into five major types of actors (input suppliers, producers, local traders, retailers and consumers) who perform different roles right away from production to consumption. The study also identified the main socio-economic factors influencing small holder farmers' participation in potato production and value addition in Ndorwa County West were; gender, access to capital, access to technology, household size (labour), quantity harvested, engagement in off- farm activities and group membership. The study further confirmed that; access to credit services, un-organized markets, un-reliable power, access to extension service, access to value addition information and lack of formal arrangements along the chain were the main institutional factors influencing small holder farmer's participation in potato value addition.

5.5 Conclusion

In conclusion, the study confirmed that unlike the standard value chain at national level that is longer (comprising of producers, commission agents, local traders, wholesalers, processors, retailers and consumers), the potato value chain in Ndorwa County West generally has fewer actors that are classified into five major categories (input suppliers, producers, local traders,

retailers and consumers) who perform different roles in the movement of potato from production to consumption.

The main socio-economic factors limiting smallholder farmers' participation in potato production and value addition included; gender, access to capital, access to technology, household size (labour), quantity harvested, engagement in off- farm activities and group membership.

The study further confirmed that access to credit services, un-organized markets, un-reliable power, access to extension service, access to value addition information and lack of formal arrangements along the chain were the main institutional factors limiting small holder farmers' participation in potato value addition in Ndorwa County west.

5.6 Recommendations

In regard to the findings, the following are the recommendations made from the study;

Farmers should be encouraged to form organized groups that will help them to pool enough capital needed to take on some of the new technologies such as improved packaging materials, inputs and processing facilities. Organized groups normally buy in bulk and at subsidized prices that are friendly and this will motivate smallholder farmers to engage in potato value addition.

Farmers need to be encouraged to diversify sources of credit access. This is mainly achieved through capitalizing at farmer group-level by joining farmer groups, SACCOs, and VSLAs. In addition, the government should guide the financial institutions on how to give out loans to especially farmers without them demanding more complicated loan terms that most farmers may

not satisfy like collateral security, monthly payback period, etc. The payback period should at least be at the end of the season to encourage more farmers to apply for loans.

From the findings, it was evident that more female actors are engaged in production and consumption while as male actors are largely involved in the value chain nodes of trading and processing. Therefore based on this finding, female actors should be organized in their groups and trained in value addition and processing of potatoes so as to compete favorably with the male actors.

Productivity and production enhancing technologies and inputs should be used by farmers so as to boost the volume of produce. This in turn motivates smallholder farmers to engage in potato value addition.

Farmers who belonged to groups were times more likely to participate in potato value addition than those who operate as individuals. Therefore, there is need to establish and/or strengthen cooperatives/ strong farm groups that engage in potato production and value addition to achieve the economies of scale needed to meet buyers' high demand.

To mitigate the challenge of lack of access to value addition information, smallholder farmers need to access it through; trainings, organizing exposure visits, seminars and on farm visits by agriculture extension workers for follow up.

The possible remedy for un-organised markets and poor storage facilities is to encourage value chain actors to form actor-based groups. This is because organized groups have the capacity to influence markets by setting up prices (enhanced farmers' ability to access inputs cheaply and to bargain for better prices), and put in place and enforce standard measures to ensure uniformity in weight, size or variety for quality assurance. Organized groups can pool enough capital for

establishment of storage facilities and collection centers that are crucial in addressing the challenge of seasonality and price fluctuations, both of which affect profit margins at all levels of the potato value chain.

5.7 Areas for further research

Other studies should be conducted on;

The level of uptake of potato value addition as an income generation activity for smallholder households.

Diverse information needs along the potato value chain, for the different actors.

Capital requirements of the value chain actors.

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Appendices

Appendix I: Questionnaire for farmers

Dear respondent

I am **Akankunda Loydah**, a student of Bishop Stuart University carrying out a study titled **“Factors influencing smallholder farmers’ participation in Irish potato value addition in Ndorwa County West, Kabale District”**. This study is part of the requirements for my course and is for academic purposes only, the answers that you provide will be treated with utmost confidentiality, please co-operate by providing the correct information only.

SECTION A: Demographic data

1. Name (optional).....
2. Telephone number..... Sub county.....
3. Parish.....Village.....
4. Position in the household
5. Gender: a. Male () b. Female ()
6. Age in years.....
7. Educational level in years.....
8. Marital status
a. Never married () b. Married () c. Separated ()
d. Others.....
9. Source of livelihood
a. Farming ()
b. Business ()

Seed potato is more marketable / profitable					
Fresh potato is more marketable / profitable					
Packed potato is more marketable / profitable					
Partially dried potato					
Crisps					
Cheeps					
Boiled potato					
Roasted potato					

15. Other (Specify)

.....

SECTION D: Socio-economic factors influencing small holder farmer’s participation in potato value addition

16. Do you participate in any of the following forms of potato value addition?

Form of value addition	Yes	No	If yes, why	If no, why
Sorting / grading according to size				
Washing/ cleaning				
Packaging in different quantities				
Moisture control /drying				
Removal of rotten ones				
Making crisps				
Making cheeps				
Boiling				
Roasting				

17. How much potato do you put into any of the following forms of value addition?

Form of value addition	Quantity in sacks
Sorting / grading according to size	
Washing/ cleaning	
Packaging in different quantities	
Moisture control /drying	
Removal of rotten ones	
Making crisps	
Making cheeps	
Boiling	
Roasting	

18. Give your opinion on the following socio-economic factors limiting small holder farmer's participation potato value addition?

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Factor	SA	A	N	SD	D
Age of the household head					
Gender of the household head					
Educational level					
Economic status					
Knowledge on value addition					
Inadequate capital for investment					
Lack of post-harvest handling and value addition technologies					
Lack of storage facilities					
Smaller size harvest					
Poor quality potato					

19. Other (Specify)

.....
.....
.....
.....

20. What can be done to address all the factors highlighted in 18 above?

Factor	Ways of addressing each factor
Gender of the household head	
Economic status	
Lack of knowledge on value addition	
Inadequate capital for investment	
Lack of post-harvest handling and value addition technologies	
Lack of storage facilities	
Smaller size harvest	
Poor quality potato	

21. Any last remarks about the study?

.....
.....
.....

Thank you

- b. Kinigye
- c. Victoria
- d. other varieties.....
4. Who do you buy potato from?
- a. farmers () b. commission men () c. others.....
5. What qualities do you look for before buying potato?
- a. variety () b. size () c. level of damage () d. color ()
- e. taste () f. others.....
6. Where do sell the potato?
- a. households () b. village market () c. urban market () d. others....
7. Where do you get information on the variety of potato that is more marketable or profitable?
- a. on phone () b. radio programs () c. TV () d. fellow traders ()
- e. Others.....
8. Which form of transport do you use to transport Irish to the market?
- a. foot () b. bicycle () c. motorcycle ()
- d. lorry () e. Others
9. Who are your customers?
- a. Households () b. Institutions () c. Hotels () d. processors ()
- e. Others
10. Do you access any training or information on potato marketing?
- a. Yes () b. No ()
11. If yes, what is your source of training or information?
- a. government extension worker () b. Fellow traders () c. NGOs ()
- d. Others.....

12. How often do get trained or receive marketing information?

- a. None () b. Once in a week () c. twice in a week ()
 d. Thrice weekly; () e. monthly ()

13. Does the training or information received important for your business?

- a. Yes () b. No ()

14. If yes, how?

.....

15. Do you do any form of processing after buying potato from farmers?

- a. Yes () b. No ()

16. If yes, what form of processing?

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Statement	SA	A	N	SD	D
I do sorting / grading according to size					
I do washing/ cleaning					
I do processing them for planting seed					
I do packaging in different quantities					
I do moisture control and drying					
I remove rotten ones					

SECTION C: Factors influencing participation in potato value addition

17. Which form of value addition do you do?

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Statement	SA	A	N	SD	D

I make crisps					
I make cheeps					
I do packaging					
I do partial drying					
I do some boiling					

18. Other (Specify)

.....

19. What is your main motive for value addition?

- a. Income () b. improve quality () c. boost shelf life ()
 d. attract more customers () e. Others.....

20. What motivates you to choose the form of value addition in 3 above?

.....

21. What is the most popular form of potato value addition done in this (local) area?

.....

22. What are the factors limiting you from participating in any of the forms of value addition below? (Multiple factors accepted)

Form of value addition	Factor (s)
Sorting / grading according to size	
Washing/ cleaning	
Packaging in different quantities	
Moisture control /drying	
Removal of rotten ones	

Making crisps	
Making cheeps	
Boiling	
Roasting	

23. Give your opinion on the following socio-economic factors limiting small holder farmer's participation potato value addition

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Factor	SA	A	N	SD	D
Low knowledge on value addition					
Inadequate capital for investment					
Lack of post-harvest handling and value addition technologies					
Lack of storage facilities					
Lack of dryers					
Poor quality potato					
Limited market information					
Limited access to credit services					
Poor infrastructure					
Power blackouts					
Lack of clear legal environment					

24. Other (Specify)

.....

25. Any last remarks about the study?

.....

Thank you

5. How many sacks of potato do you process per season

6. How much do you buy a full sack of potato (in shs).....

7. Which form of value addition do you do?

a. none () b. crisps () c. packaging () d. cheeps ()

e. boiling () f. other (specify).....

8. Where do you sell the products made in 7 above?

a. households () b. village market () c. urban market () d. others....

8. Who are your customers?

a. Households () b. Institutions () c. Hotels () d. supermarkets ()

e. Others

9. Which form of potato is more profitable of marketable?

a. seedlings () b. fresh () c. processed () d. others....

10. What is your motive behind potato processing?

a. Income () b. improve quality () c. boost shelf life ()

d. attract more customers () e. Others.....

11. Do you receive any form of training or information on potato processing?

a. Yes () b. No ()

12. If yes, source of training or information?

a. government extension worker () b. Fellow traders () c. NGOs ()

d. Others.....

13. Has the training or information received helped you in one way or another?

a. Yes () b. No ()

14. If yes, how?

.....
.....
.....

SECTION D: Factors influencing participation in potato value addition

16. Do you face any challenges during processing?

- a. Yes () b. No ()

17. If yes, mention some of these challenges?

a. socio-economic challenges

.....
.....
.....

b. institutional challenges

.....
.....
.....

18. What can be done to address some of these challenges?

.....
.....
.....

20. Any last remarks about the study?

.....
.....
.....

Thank you

Appendix IV: Interview Guide for Key Informants

Dear respondent

I am **Akankunda Loydah**, a student of Bishop Stuart University carrying out a study titled **“Factors influencing smallholder farmers’ participation in Irish potato value addition in Ndorwa County West, Kabale District”** This study is part of the requirements for my course and is for academic purposes only, the answers that you provide will be treated with utmost confidentiality, please co-operate by providing the correct information only.

1. What are types of Irish potato grown in this area?
2. What is the source of seed inputs grown?
3. Do farmers receive any form of training on potato value addition? If yes, specify
4. Who are the sources of training?
5. Who are the key participants in the potato sector right from production to the end point?
6. Who are potato value chain actors at national level?
7. Who are potato value chain actors Ndorwa County west?
8. What are the services and process in the potato value chain?
9. Give your opinion on the following socio-economic and institutional factors limiting small holder farmer’s participation in potato value addition

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Factor	SA	A	N	SD	D
Low knowledge on value addition					
Inadequate capital for investment					
Lack of post-harvest handling and value addition technologies					
Lack of storage facilities					

Lack of dryers					
Poor quality potato					
Limited market information					
Limited access to credit services					
Poor infrastructure					
Power blackouts					
Lack of clear legal environment					

10. Which form of value addition do you do?

SA= for Strong Agree, A = Agree, N= Neutral, D = Disagree, SD = Strongly Agree

Statement	SA	A	N	SD	D
I make crisps					
I make cheeps					
I do packaging					
I do partial drying					
I do some boiling					
Transportation					
Storage					
Wholesaling					
Sorting and grading					

11. How is government making an effort to address some of these factors?

12. Any last remarks about the study?

Thank you