

# Institutional Factors Influencing Small Holder Farmers' Participation in Potato Value Addition in Ndorwa County West, Kabale District

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## Abstract

This study investigated the factors influencing small holder farmers' participation in Irish potato value addition in Ndorwa County West, Kabale District. The general objective was to determine factors influencing small holder farmers' participation in potato value addition in Ndorwa County west of Kabale district. The specific objectives were to; establish the socio-economic factors influencing participation in potato value chain and to establish institutional factors influencing participation in potato value chain. The study was a cross sectional descriptive survey employing both qualitative and quantitative approaches of data collection and analysis. Data was collected from 206 small holder farmers and other value chain actors (input suppliers, commission men, rural hawkers, traders, wholesalers, retailers and consumers) using questionnaire and interviews. Data management and analysis was done using SPSS version 16.0 to generate both descriptive and regression statistics. The main institutional factors influencing small holder farmers' participation in potato production and value addition were found to be; access to credit services, un-reliable power, access to extension service, lack of value addition information and lack of formal arrangements along the value chain. It therefore recommends farmers to 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 so as to compete favorably with the male actors. Value chain actors need to access the necessary information on value addition through trainings, exposure visits, seminars and on farm visits by agriculture extension workers for follow-up.

**Keywords:** Institutional factors; Small holder farmers, Value addition; Potato value chain; Uganda

## Introduction

Irish potato is grown worldwide and in most of the developing countries, it is considered one of the most important food crop [1]. In terms of volume of production, potato is ranked among the top ten food crops produced in developing countries [2,3]. Since the second half of the 20th century the relative importance of potato has slowly shifted from developed to developing countries where more potato is produced in the latter than the former. Area expansion has been cited to have fuelled its increased production more than any other major field crop with exception of soybeans with an estimated annual rate of area expansion exceeding 2% in the last 40 years [4].

In Africa and sub-Saharan in particular, potato production is estimated to have doubled from 400 metric tons to 790 metric tons between 2004 and 2018, with 70% of this growth concentrated in Eastern Africa [5]. Much of the potato in East Africa and Uganda in particular, is grown by smallholders who own less than one hectare of land per household [6]. Despite enormous opportunities for value addition and trade at the national, regional and global levels, potato production in region remains largely for household consumption [7].

In Uganda, potato is considered both a food security and cash crop and it is one of the 12 agricultural commodities prioritized by Government of Uganda [6]. FAO (2011) [8] estimated potato production at 280,000 metric tonnes per annum (7.14 tonnes per ha) and the quantity demanded of potato was estimated to increase from 32.8% in 2015 and to 47% in 2019 due to the increasing population [9]. Production of potato is concentrated in Kigezi highlands of Kabale and Kisoro in the south-western part of the country, and Mt. Elgon highland districts of Mbale and Kapchorwa in eastern with altitudes between 1,500 and 3000 m above sea level [10]. The Kigezi highlands produce about 60% of total Ugandan potato output [11] and Eastern Uganda contributes 10%. The remaining 30% comes from the districts of Mubende, Nebbi, Masaka, Mbarara and Rakai [12,13]. The introduction of lowland varieties in recent years extended the crop to other regions like the central and west Nile as a commercial activity and this has increased potato output over the years [14]. The rapid growth in farmer engagement in potato production is attributed to rapid urban population whose changing food eating habits has increased the market demand of potato [15]. This increase in potato production has a strong impact on potato markets; not only in creating opportunities for the smallholder farmers but also posing serious threats due to competition with larger suppliers of potatoes globally (FAO, 2014) [8]. Although Uganda is ranked third producer of potato in East and Central Africa, the bulk of the crop produced (80%) is mostly consumed domestically [10], implying limited participation of small holder farmers in regional markets partly attributed to limited value addition to potato as required by these markets [13]. Despite the growing demand for potato both locally and urban markets, potato value chain actors continue to exhibit low per capita value added product due to different socio-economic and institutional influences [15]. 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 [15]. This has not only affected the supply of the crop on market but has equally limited incomes for the different value chain actors [18]. Government efforts to boost potato production and market participation have mainly focused on research and development [8]. 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 [9]. The chain actors generally lack sufficient knowledge, information and enough resources to help them add value, meet quality standards and formal market specifications [16], hence limiting their access to lucrative markets. Causes of market inefficiency are partially documented [15]. It is therefore imperative to understand the level of potato value addition and chain development and limiting factors in order to recommend alternative value addition options the farmers and other actors could choose from to improve gains from potato value chain. This study therefore determined factors that influence potato value addition in Ndoorwa County west, Kabale District.

## 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) [17] which is attributed to increased land under production. Likewise, the demand for Irish potatoes has also increased to

over 850,000 MT per annum with urban demand outpacing rural demand. With the increasing urbanization, changing eating habits by the majority 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).

Apparently, 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 [16]. Ndoorwa County West in Kabale District happens to be among the top potato producing areas in Uganda [6]. Despite the growing demand for potato from the locals and surrounding districts in the region, chain actors continue to exhibit low per capita value-added product and value chain participation [6] 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 [15]. There is a general lack of information about reasons behind poor potato value addition in Ndoorwa County west given that no study has been done to explore such factors in the area. Understanding institutional factors influencing potato value addition was a key to unlocking market potential for chain actors and overcoming value chain participation hindrances for smallholder farmers.

## Study Hypothesis

Ho: There are no institutional factors influencing small holder farmers' participation in potato production and value addition

Ha: There are institutional factors influencing small holder farmers' participation in potato production and value addition

## Materials and Methods

The study was conducted in Ndoorwa County West, Kabale District. The major economic activity of the people in the areas agriculture with livestock and crop farming forming the backbone of the area. Potato production is done by many households for food and income generation. The agro-climatic conditions in Kabale district present a favorable environment for potato production all the year. Average land holding in the area are 3 acres, with 6 per cent of the total holding under potato every year. Though there are several potato varieties in circulation, Rwangume, Kinigye (local varieties) and Victoria are the main varieties cultivated. The choice of the area was based on the fact that Ndoorwa County West is among the areas in Kabale district where potatoes are produced. Nevertheless, little information is available about potato value chain development in the area.

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. Data was gathered from 206 respondents.

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.

The study used questionnaire and interview methods to gather primary data from the different respondent categories. A structured questionnaire containing both closed and open ended questions was designed and used to gather quantifiable information from different respondent categories. Questions were designed in English and later translated into local languages for respondents to read and respond in the languages they understood. The tool was checked for completeness, coded and entered into SPSS version 16 software for cleaning and analysis. In addition, 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.

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. 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. 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. 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.

Analysis was done using a logistic regression model where the dependent variable was probability of participation in the potato value chain. The independent variables included; input supply, access to financial/ credit services, poor organization along the chain, transport issues, legal environment, lack of organized markets, inadequate infrastructure, unreliable 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.

A binary logistic model for analysis was specified as below;

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

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



Figure 1. Briefing Respondents about the Purpose of Research to Respondents from Kitumba Sub County



Figure 2. Interviewing Some of the Key Informants from Kitumba Sub County

## Results

Table 1. Categories of Potato Value Chain Actors

Respondent category	Percent (%)
Input suppliers	3.4
Producers	74.3
Traders	4.8
Processors	11.6
Consumers	5.8
Total	100%

Results in table 1 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.

Table 2. Parameter Estimates for Institutional Factors Influencing Small Holder Farmers' Participation in Potato Value Addition in Ndorwa County West

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

- OR → Odds Ratio
- CI → Confidence Interval

The results of the analysis were presented in table 2. 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 including access to credit services presented a significant association with smallholder participation in potato production [AOR = 2.808; (95% CI: 0.319 - 5.978); p = 0.002], lack of organized markets [AOR = 0.789; (95% CI: 0.113 - 2.116); p = 0.039], power shortage and load shading [AOR = 0.121; (95% CI: 0.226 - 2.566); p = 0.004], access to extension service [AOR = 1.603; (95% CI: 0.390 - 3.933); p = 0.023], inaccessibility to value addition information [AOR = 0.936; (95% CI: 0.468 - 1.158); p = 0.015], and lack of formal arrangements along the chain [AOR = 0.493; (95% CI: 0.275 - 0.887); p = 0.018].

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".*

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 thereby 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 3. Extension Worker from Rubaya 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 an interview with an extension agent, he said;

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



Figure 4. Value Addition through Sorting and Grading by Farmers from Butanda Sub County

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 versa [AOR = 0.493; (95% CI: 0.275 - 0.887); p = 0.018].

## Discussion, Conclusion and Recommendations

This chapter discusses the findings, draws conclusions and makes recommendations based on the study findings.

### Discussion

The study identified different significant institutional factors limiting smallholder farmers' participation in potato production and value addition in Ngorwa 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) that 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) [20] 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 small holder farmers 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 and value addition. 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 [21] 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 [2] which stated that agricultural extension services provided by agricultural officers 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 (processing). One cannot talk about value addition through processing without considering the central and crucial role energy plays. The area's 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) [19] who argued that unreliable power supply affects the value addition process on various vegetables especially those that require power for processing.

## Conclusion

In conclusion, the study confirmed factors like lack of credit access, unorganized markets, un-reliable power, lack of access to extension service, inaccessibility to value addition information and lack of formal arrangements along the chain to be the main institutional factors limiting small holder farmers' participation in potato value addition in Ndoorwa County west.

## Recommendations

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

The study recommended farmers to form actor- based groups. This is because organized groups have the capacity to influence markets by setting up 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. Organized groups can also attract the services of extension workers.

Farmers also need to be encouraged to diversify sources of credit access. This could be 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 farmers without complicated loan terms that most farmers may not satisfy like collateral security, monthly payback period.

Farmers in groups were 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 farmer groups that engage in potato production and value addition to achieve the economies of scale needed to meet buyers' high demand.

The challenge of lack of access to value addition information should be mitigated through farmer trainings, organizing exposure visits, and on farm visits by agriculture extension workers for follow up.

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## Conflict of interests

None.

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