

Assessment of the Factors Influencing the Irish Potato Producers' Market Channel Choice in Rwanda: A Case of Study Musanze District

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Abstract: Agriculture plays an important role in the economic growth and development prospects of a vast majority of developing countries including Rwanda. Market channel choice makes important contributions to the incomes and other livelihood attributes among smallholder farmers in these countries. The main aim of this study was to assess the factors influencing the Irish potato producer's to choice a market channel in Rwanda. A case study Musanze District. A multistage sampling procedure was specifically used to select Musanze district form five composed Northern Province. Four Irish potato producers in each village were randomly selected using simple random sampling to give a total sample size of 209 respondents interviewed in study area. Both descriptive statistics and the multinomial logistic regression model were used to analyse data that was collected from Irish potato producers in study area. The results of the study showed that the majority of respondents were male. The findings showed that the majority of respondents are in range 46-55 years followed by the range of 56 years. The result of Multinomial Logit regression analysis showed that education level, household size, land size, and the quantity produced were significant at $p < 0.01$ to influence Irish potato producers to choice direct consumer as market channel. However, the results also showed that also five variables such as age, land size, quantity produced, price of produce as well as mode of payment had positive and significant influence on the Irish potato producers to choose retailers as market channel. Lastly, seven factors namely gender, education level, household size, farming experience, quantity produced, quantity sold, and price of produce were found to be positive and had significant influence on the Irish potato producers to choose other markets as market channel. Based on the findings from this study, the researcher recommended that adequate market information should be provided to the Irish potato producers through existing sources such as extension officers, agronomist, local authorities, and associations/cooperatives as well as to increase producer's income and improve their livelihood.

Keywords: Factors Influencing, Irish Potato, Producers, Market Channel

1. Introduction

Agriculture plays an important role in the economic growth and development prospects of a vast majority of developing countries including Rwanda. More than 85% of the Rwandan population resides in the rural areas and is engaged in agricultural production as the main source of livelihood [10]. In many developing countries including Rwanda, formal agricultural marketing are still sprouting, smallholder farmers facilitated to access to agricultural market which is the key to reduce poverty and increase food security

[12]. Potato is an important food crop, which is grown in over 100 countries worldwide. Potato is consumed by more than one billion people in the world. Irish potato has become the fourth most important food crop in the world following rice, maize and wheat [5, 8]. The crop is one of the most important sources of income and employment in the rural areas [22].

Despite the importance of markets, smallholder farmers especially in developing countries find it difficult to participate in markets because of the numerous constraints and barriers such as costs associated with exchanging goods or services [28]. Many farmers in sub-Saharan Africa (SSA)

complain about low and volatile price; the low level of profit they earn from their products as well as unstructured markets and disorganised supply chains [11]. Poor potato prices are a result of farmer's inability to put up storage facilities forcing them to dispose them off at throwaway prices. Market cartels on the other hand are a big blow to farmers since they dictate the commodity prices. Therefore, most farmers consume their own potatoes within a period of about three months, and after that, they purchase potatoes for home consumption. Improved storage of ware potatoes could help ensure a continuous supply of potatoes throughout the year [1].

Globally markets show that, Irish potato in developing countries are still lagging behind on marketing process of Irish potatoes [5]. During harvesting period, most farmers do not store potatoes but sell directly from the field. This leads to having surplus in the market that depresses prices hence low net returns to farmers [7]. In Rwanda, farmers generally have limited market power and they often sell when they need cash and their bargaining position is weak [25].

In Musanze district, there are 25 potato collection centres managed by farmer cooperatives but some farmers do not use the collecting points due to the low price offered and delay in payment compared to the local market. The domination of brokers along the marketing channel is among the factors that contribute to increase Irish potatoes market channel and decrease in margin because farmers sell their potatoes through brokers [18]. Therefore, availability of market opportunities will encourage the smallholder farmers to improve production to meet the increasing consumer's demands [17].

Marketing of Irish potato is constrained by high product perishability and limited on-farm storage facilities [15]. The marketing channel is one of the best solutions to overcome the constraints of selling potato production at lower price. The marketing channel starts at the farm-gate and ends at the consumer's front door. The marketing channel approach focuses on firm's selling strategies to satisfy consumer preferences [24]. The most of potato producers sell their crop to warehouse stores and traders in the village who then transport it to different places inside or outside the country [19]. Generally, the marketing chain in any agricultural production involves a number of players such as the farmer or producers, village traders, wholesalers, retailers and consumers or a processor [11].

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 margin [9]. Despite the expansion of information and communications technologies, smallholder farmers in many developing countries continue to have limited or no access to market information [27]. As a result, they sell their produce at the farm gate or village markets where profits are low. Contract farming with supermarkets can be beneficial to smallholder farmers in developing countries as they open up marketing opportunities [21]. The main aim of this study was to assess the factors influencing the Irish potato producer's to choose a marketing channel in Rwanda. A case

study Musanze District.

1. To describe the social economic characteristics of the Irish potato producers in study area.
2. To assess the level of awareness of Irish potato producers on marketing channel choice.
3. To determine the factors influencing the Irish potato producers to choose a market channel.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in Musanze district one of the five composed Northern Province of Rwanda. The total area of the district is 530, 4 km². It is divided into 15 sectors 68 cells and 432 villages. Musanze district is located at 1.50 latitude and 29.63 longitude and it is situated at elevation 1849 meters above sea level. It is Rwanda's most mountainous district, containing the largest part of the Volcanoes National Park. Musanze District has a tropical climate of high altitude with an average temperature of 20°C and the rain that varies between 1400 mm and 1800 mm. Agriculture is the lifeblood of the District. At least 91% of the population is engaged in agriculture. Musanze is considered as a country granary [20].

2.2. Research Design and Sampling Procedure

A multistage sampling procedure was used to select specific Musanze districts from five composed Northern Province. The first stage was a purposive selection of four sectors namely (Gataraga, Kinigi, Nyange, and Cyuve) out of the 15 sectors of Musanze district. The selection of these sectors was mainly based on the high intensity and availability of Irish potato producers compared to the left sectors. The second stage was the selection of 12 villages in each sector where communities are engaged in Irish potato production.

2.3. Target Population and Sample Size

The target population of this study was the farmers involved in Irish potato farming in Musanze district as the area with significant potatoes production and trading activities. The total number of potato farmers in Musanze district is estimated as 17,368 habitants majority of who grow Irish potato. Four Irish potato producers in each village were randomly selected using simple random sampling to give a total sample size of 209 respondents interviewed in study area.

2.4. Data Analysis

The collected data was coded and entered into computer using a STATA software version 14 for analysis. Both descriptive statistics and the multinomial logistic regression model were used to analyse data that was collected from Irish potato producers in study area. The descriptive statistics such as frequencies, percentages were used to describe and characterise producers socio-economic while multinomial logit regression econometric model was employed to analyse the factors influencing Irish potato producers to choose the marketing

channel in Musanze district. It is assumed that these decisions are made based on the option that maximises utility subject to technical, institutional and socio-economic constraints.

2.5. Model Specification

To determine the factors influencing the Irish potato producers to choose a marketing channel in Musanze district. The multinomial Logit model was employed. The choice of a given marketing channel is discrete because it is chosen among other alternative channels. Therefore, let P_{ij} represent the probability of choice of any given market channel by Irish potato producers, then equation representing this will be,

$$P_{ij} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + e \quad (1)$$

Where i takes values (1, 2, 3, 4), each representing the choice of marketing channel (1=Consumer, 2=Broker, 3=Retail, 4=Other).

Where:

X_1 - X_n are factors influencing market channel choice,

β_1 - β_n are parameters to be estimated,

e is randomized error. With j alternatives,

The multinomial Logit model for marketing channel chose is given below as follow:

$$P_{ij} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + \varepsilon_i \quad (2)$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{12} + e \quad (3)$$

Where:

Y represents the choice of market channel

X_1 = Age (years)

X_2 = Gender (Dummy, male = 1, female = 0)

X_3 = Household size (number of persons in household)

X_4 = Educational level (years spent in school)

X_5 = Household size (number)

X_6 = Land size (Ha)

X_7 = Farming experience (years)

X_8 = Quantity produced (Kg)

X_9 = Irish sold (Kg)

X_{10} = Market satisfaction (dummy, 1=yes, 0=no)

X_{11} = Price of produce (Rwf)

X_{12} = Distance to market (km)

X_{13} = Model of payment (Dummy, cash=1, other = 0)

e = error term

β_0 =intercept

β_1 - β_{12} = parameters to be estimated

3. Results and Discussions

3.1. Demographic Characteristics of Respondents Surveyed in Study Area

The study about the description of demographic characteristics of respondents mainly focused on specific aspects of the respondents especially their gender, age, education level, farming experience, Household size, as well as land size.

Table 1. Social economic characteristics of Irish potato producers in Musanze district.

	Frequency	Percentage
Gender		
Male	125	59.8
Female	84	40.2
Age		
Less than 25Years	6	2.9
Between 25-35	39	18.7
Between 36-45	50	23.9
Between 46-55	58	27.7
56 and above	56	26.8
Education level		
Illiterate	66	31.6
Primary	86	41.1
Secondary	36	17.3
University	21	10
Farming experience		
Less than 5 Years	9	4.3
Between 5-15	55	26.3
Between 16-25	85	40.7
26 and above	60	28.7
Household size		
Less than 4	52	24.9
Between 4-7	112	53.6
8 and above	45	21.5
Land size		
Less than 0.5Ha	174	83.3
Between 0.6-1Ha	28	13.4
Between 1.1-2Ha	5	2.4
2.1Ha and above	2	0.9

From the results presented in (table 1), the majority of 59.8% of respondents were male and 40.2% were female. This due to high number of male heading the household rather than female in study area. The men are majority in this sector because Irish potato is the second crop considered as the main source of income after pyrethrum in study area. The findings showed that the majority of respondents are in range 46-55 years represented by 27.7% followed by the range of 56 years and above with 26.8%. The third group is in the range between 36-45 with 23.9%. These three ranges indicated that more than 70% of this sector practiced by mature people. This is due the high number of youth do not have their own properties of land that should be used to practice agriculture especially to grow Irish potato. The results of the study revealed that the majority of respondents attended primary school with 41.1% followed illiterate represented by 31.6%. Only 17.3% and 10% of the respondents had completed their high school and University respectively. This means that Irish potato producers in study area should be increased in the high-educated people, which can facilitate the adoption of new technologies and innovation because these educated people understand very quickly than illiterate people. The majority of respondent in study area are in range between 16-25 years of farming experience represented by 40.8%. This is followed by the range of 26 and above with 28.7%. The results of the study indicated that only 4.3% of respondents had less than five years of experience in Irish potato farming. This shows that, Irish potato farming is not new activity and producers can achieve high production through well management of different agricultural practices from land preparation to harvesting and selling. The results

also showed that household had many member is between 4-7 people with 53.6% followed by the range of less than 4 members with 24.9%. The last class is that of 8 members and above with 21.5%. This should imply that the more members of household, the higher number of no hired labours that reduce production costs. The results in (table 1) showed that 83.3% of respondents had farm size less than 0.5 hectare, followed by the range of between 0.6-1ha with 13.4% while the range between 1.1-2ha and 2.1ha and above are represented by 2.4% and 0.9% respectively. This shows that the shortage of land as one of the limiting factors of Irish potato production in study area.

3.2. Level of Awareness of Irish Potato Producers About Market Channel Choice

Result in (Table 2) shows that farmers had high level of awareness on direct consumer with (90, 4%) followed by other market channels with (97.2%). The respondents indicated that they have higher awareness about direct consumers because these ones pay what the bought directly and especially by cash in hand, rather than other market channels some customers pay after a long time while some other do not pay as well. The third and fourth market channels awarded by the Irish potato

producers are retailers and wholesalers with (58.8%) and (57.9%) respectively. This implies that Irish potato producers were familiar with market channel choice due to the experience of Irish potato production and marketing depending on source of information about market and price of produce. The findings of this study was supported by the study of Kudi *et al.*, [14] when they studied awareness of new maize varieties by maize farmers. They further explained that maize farmers found information on improved maize varieties from radio, extension agents, other farmers, village/ward heads and their friends while explaining that most of the farmers obtained information (awareness) through extension agents. Majority of the farmers obtained information from extension agents followed by fellow farmers [13]. The results of the study indicated that the Irish potato producers had lower awareness on broker channel with (48, 3%) in the other word the farmer showed that they are not aware with Broker at (51.7%) in study area. This is because brokers in study area like in other regions of country, they always buy production at lower price, which in return cause high loses, of producer. Generally, brokers make producer to be a price taker due to the phenomena of price fluctuation especially at harvesting or early harvesting period.

Table 2. Distribution of Irish potato producers According to the Level of Awareness of market channel choice.

Market channel	Aware		Not aware	
	Frequency	Percentage	Frequency	Percentage
Direct consumer	189	90.4	20	9.6
Other markets	146	69.8	63	30.1
Retailer	125	59.8	84	40.2
Wholesaler	121	57.9	88	41.1
Broker	101	48.3	108	51.7

3.3. Factors Influencing the Irish Potato Producers on Marketing Channels Choice

The result of Multinomial Logit regression analysis in (Table 3) shows that six factors such as gender, education level, Household size, land size, quantity produced, and market satisfaction had positive and significant influence on the Irish potato producers to choose direct consumer as market channel in study area. These variables were significant among respondents who sold directly at the direct consumers. As shown by the significance of results education level, household size, land size, and the quantity produced are statistically significant at $p < 0.01$. While, gender and market satisfaction are significant at 5% and 10% level respectively.

This implies that 1-year increase in the years spent in school should influence the Irish potato producer's market channel choice by 0.2%. This is because; educated households are expected to have better skills and better access to information and ability to process information. Generally, education plays an important role in adoption of new technologies and believed to improve readiness of a head to accept new ideas and innovations. It also enables a head to get updated demand and supply information on Irish potato production. In other hand, a unit increase in farm size should influence Irish potato

producer's market channel choice by 0.2%. This was supported also by the study of Bawa and Ani [4] and Olusegun *et al.* [23] reported that farm size had bearing on the capacity of farmers to utilize agricultural innovation and new farm practices. They indicated that there was positive and significant relationship between farm size and agricultural innovation utilization.

For the same purpose 1%, increase in quantity of Irish potato produced should influence market channel chose by 0.9%. This is because smallholder farmers in the study area like in the other agro climatic zones of country firstly need to satisfy household consumption requirements before engaging in the decision to participate in markets channels. This means that the farmers who have more yields have more opportunities of selling their produce at the market places than those with the little produce. The finding is in line with that of Chalwe [6] who found more of the beans produced are sold to the private traders in the market places than to other households at the farm gate. The results in table founded out that four variables such as land size, farming experience, quantity produced, market satisfaction, and price of produce had positive and significant influence on the Irish potato producers to choose brokers as market channel.

This is for example means that, the experienced farmers would have built up contacts in different market channels, and is able to meet the often-stringent requirements in the formal

market channel. While an inexperienced farmer's lack the capacity of creating market networks with other buyers in the formal channel. However, the results in same table showed that also five variables such as age, land size, quantity produced, price of produce as well as mode of payment had positive and significant influence on the Irish potato producers to choose retailers as market channel. Lastly, seven factors namely gender, education level, household size, farming experience, quantity produced, quantity sold, and price of produce were found to be positive and had significant influence on the Irish potato producers to choose other markets as market channel. The results indicated that gender, education level, household size were statistically significant at $p < 0.01$. Where, quantity sold, farming experience, quantity sold, price of produce were significant at 5% and 10% level respectively. This implies that 1-year increase in the years spent in school should influence the Irish potato producer's market channel choice in the market channel by 0.3%. This was supported by the study of Angula [3] who showed that education enhances managerial competence and successful implementation of improved production,

processing and marketing practices.

It also implies that 1 member increase in household should influence Irish potato producer's market channel choice by 0.7%. This was supported by the study of Mango *et al.*, [16] who suggest that large household size positively assisted the farmer in selling produce either at farm-gate or at the local market, others argue that large households encourage consumption with less marketable surplus, or facilitates search for more profitable market options rather than selling at farm-gate.

Distance to market was only one factors had a negative influenced on Irish potato producers to choose a market channel for all the four market channels indicated in table 2 of results. This for example implies that 1 unit increase in distance from farm to the market should reduce the market channel choice by 0.4% in the broker. Past studies show that the farther away the farmer was located, the less produce they brought to the market, and made more sales at the farm-gate [26]. In addition, the greater the distance to the market, higher transportation costs and lower net benefits accrue to the household [2].

Table 3. Multinomial Logit regression of the factors influencing Irish potato producer's market channel choice.

variable	Consumer			Broker		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
Age	-0.115	0.055	0.036	-0.109	0.102	0.286
Gender	0.363	1.026	0.024	-1.395	1.24	0.000
Education	0.279	0.32	0.000	-1.484	2.31	0.021
HH Size	0.623	0.249	0.012	-0.325	0.89	0.373
Land size	0.256	0.661	0.000	0.180	0.131	0.060
Farming experience	-0.019	0.060	0.748	-0.205	0.127	0.004
Quantity produced	0.907	0.004	0.001	0.001	0.177	0.007
Irish sold	-0.010	0.005	0.037	-0.003	0.394	0.000
Market satisfaction	0.464	0.378	0.069	0.555	1.750	0.080
Price per kg	-0.012	0.009	0.216	0.024	1.090	0.076
Distance to market	-0.047	0.315	0.058	-0.398	0.025	0.001
Mode of payment	1.865	2.023	0.000	-0.188	0.471	0.089
Constant	1.529	2.074	0.074	-2.094	6.609	0.051

Table 3. Continued.

variable	Retailer			Other		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
Age	0.086	0.043	0.002	-0.040	0.041	0.327
Gender	-1.149	0.729	0.115	0.245	0.537	0.001
Education	-0.088	0.30	0.765	0.304	0.217	0.000
HH Size	-0.049	0.27	0.787	0.730	0.063	0.000
Land size	0.81	0.34	0.006	-1.221	1.056	0.047
Farming experience	-0.015	0.058	0.000	0.005	0.055	0.063
Quantity produced	0.010	0.004	0.016	0.002	0.001	0.078
Irish sold	-0.011	0.048	0.013	0.647	0.401	0.052
Market satisfaction	4.061	1.419	0.998	-0.133	0.179	0.059
Price per kg	0.008	0.009	0.000	0.005	0.001	0.084
Distance to market	-0.444	0.021	0.088	-0.680	0.765	0.072
Mode of payment	1.650	2.459	0.095	-0.271	0.180	0.000
Constant	-2.257	2.839	0.004	-1.065	2.600	0.000

Number of observations=209, Prob > Chi2=0.000

Log likelihood=-143.35, Pseudo R2=0.6745.

4. Conclusions and Recommendations

The results of the study showed that the majority of

respondents were male. This due to high number of male heading the household rather than female in study area. The findings showed that the majority of respondents are in range 46-55 years followed by the range of 56 years. The results of

the study revealed that the majority of respondents attended primary school. The majority of respondent in study area have high experience in the Irish potato farming and marketing. The results also showed that the majority of Irish potato producers had farm size less than 0.5 hectare. Result revealed that farmers had high level of awareness on direct consumer followed by other market channels while Irish potato while showed that they are not aware with Broker in study area.

The result of Multinomial Logit regression analysis shows that six factors such as gender, education level, Household size, land size, quantity produced, and market satisfaction had positive and significant influence on the Irish potato producers to choose direct consumer as market channel in study area. It has been seen out that four variables such as land size, farming experience, quantity produced, market satisfaction, and price of produce had positive and significant influence on the Irish potato producers to choose brokers as market channel. However, the results in same table showed that also five variables such as age, land size, quantity produced, price of produce as well as mode of payment had positive and significant influence on the Irish potato producers to choose retailers as market channel. Lastly, seven factors namely gender, education level, household size, farming experience, quantity produced, quantity sold, and price of produce were found to be positive and had significant influence on the Irish potato producers to choose other markets as market channel.

Based on the findings from this study, the researcher recommended that adequate market information should be provided to the Irish potato producers, through existing sources such as extension officers, agronomist, local authorities, and associations/cooperatives. The market information especially current price of produce, best market channels, and Irish potato collection centers should be enhanced. As price of produce and mode of payment had positive and significant influence on the Irish potato producers to choose retailers as market channel. These should be enhanced in order to improve and increase the Irish potato producer's income. The study also recommends strengthening farmer experience should be enhanced through training on market survey and market channel choice in the area, which will reduce the problem of brokers during harvesting period in order to improve the collective bargaining power of the farmers, price fluctuations as well as their access to the formal Irish potato value chains.

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