Determinants of Farmers' Satisfaction with Access to Irish Potato Farmer Co-operatives' Services in Northern and Western Provinces, Rwanda

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Abstract. Purpose: Satisfaction of members with services offered by co-operatives is key for a co-operative success. However, it remains questionnable whether co-operatives have really achieved their expected objectives. This paper analysed the determinants of farmers' satisfaction with access to services offered by Irish Potato Farmer Co-operatives in Northern and Western Provinces of Rwanda.

Design/Methodology/Approach: The study employed descriptive design in cross-sectional research. Data were analysed descriptively and inferentially. Service accessibility level among Irish potato farmers was measured by developing an index. In assessing the level of farmers' satisfaction, satisfaction index was adapted. Demographic and socio-economic factors influencing farmers' satisfaction with Irish potato farming services were analyzed using multiple linear regression.

Findings: The regression results indicate that only gender, primary occupation, livestock ownership, and co-operative membership significantly affected farmers' satisfaction with co-operative services. Findings reported a low level of farmers' satisfaction with farming services, and co-operatives in the study area failed to resuscitate their activities, forcing some farmers' exit from Irish potato farming activities.

Practical Implications: The findings of this study generate facts to inform IPFCs, community development partners, and policymakers about farmers' satisfaction with co-operative services and how they should be improved. In addition, the paper contributes to the literature by analyzing farmers' accessibility to farming services and satisfaction with co-operative services in developing countries.

Originality/Value: This paper took a holistic perspective to cover all services that members expect from their co-operatives.

Keywords: Co-operative · Co-operative services · Farmers · Satisfaction · Irish potato · Rwanda

1 Introduction

Worldwide, farmer co-operatives are considered to be the backbone of agricultural development (Ma et al. 2021) by offering an extensive range of services to smallholder farmers, including improved access to agricultural inputs, information communication, credit, agro-processing training, and extension (ILO 2021; Lepe 2016; Zheng and Song 2011). Likewise, they serve to organise adequate storage facilities in collection centres, find markets for members' produce, promote improved technologies, and support farmers by strengthening their collective bargaining power (Seneerattanaprayul and Gan 2021; Abebaw and Haile 2013). However, smallholder farmers in developing countries face several challenges that include lack of improved technologies, access to agricultural inputs, improved storage facilities, managerial skills, weak bargaining power (Liu et al. 2021; Zheng et al. 2021; Grashuis and Dary 2021) and poor access to credit services (Ma et al. 2018).

The evolving function of farmer co-operatives has prompted many studies on the members' satisfaction with co-operative services. Morfi et al. (2021) and Morfi et al. (2015) have proved a strong relationship between co-operative membership and satisfaction with farming services. As stated by Grashuis and Cook (2019) & Tarekegn (2017), satisfaction of members is essential for a co-operative to achieve its goals and objectives. Satisfied co-operative farmers actively participate in their co-operatives' activities, hence the improved performance (Prasertsaeng et al. 2020). Co-operatives should thus move beyond maximization of financial performance as their sole criteria of success and give priority to maximizing satisfaction of members' needs through offering a range of services that can improve their social and economic status.

In Rwanda, co-operatives are central to national development (MINICOM 2018). The government of Rwanda (GoR) expects a significant contribution of co-operatives in achieving Vision 2050 (GoR 2020) and the National Transformation Strategy 2018–2024, which aims to accelerate the transformation and economic growth with the private sector (MINAGRI 2018). GoR has established an environment conducive to the development of the co-operative movement. This encompasses law N° 024/2021 governing co-operatives and other regulations for co-operative governance. The Government has also formulated a national policy of 2018 on the promotion of co-operatives to ensure that they are profitable and productive enterprises capable of delivering services and creating surpluses for themselves and their members. In addition, the Government collaborates with co-operatives in activities such as value chain development, research, and extension (MINICOM 2018).

Furthermore, in 2002, the GoR launched a Crop Intensification Programme (CIP) to increase national agricultural productivity and food security. Irish potato was prioritised as one of the priority crops (FAO 2016). Production of Irish potatoes covers 40.6% of the gross agricultural production value and 28.7% of the total cultivated area (NISR 2016). Irish Potato Farmer Co-operatives (IPFCs) were chosen to be the strategic vehicle in improving the production. Given the Government policy to organize Irish potato farming, every farmer has to join IPFCs. The aim is to make co-operatives stronger to manage collection centers (Mbarushimana 2018). Within IPFCs, farmers can easily get subsidies,

financial credit, training on best farming practices, and storage facilities in collection centers to reduce exploitation by middlemen (MINAGRI 2018).

Despite the above initiatives, IPFCs failed to improve their services in the face of competition from private investors (FAO 2015). Members of IPFCs in Rwanda are unsatisfied with market for their production due to speculative pricing by unscrupulous buyers. Consequently, they do business with private traders, which strongly affect performance of smallholder farmer co-operatives (Kanamugire 2017).

While in a considerable number of studies (Grashuis and Cook 2019; Singh et al. 2019), performance assessment in co-operatives is dominated by financial ratios, researchers use the satisfaction of members with co-operatives services to measure the success of these organizations. Satisfaction of farmers with services offered by co-operatives as key for co-operative success (Sultana et al. 2020; Marete 2010), is viewed as an important measure of co-operative performance, and target for policy formulation (López-Ridaura et al. 2002). However, there are still limited studies conducted on farmers' satisfaction with co-operative services.

In this perspective, this study intended to fill the gap by analysing determinants of farmers' satisfaction with the services offered by IPFCs in Northern and Western Provinces, Rwanda. This paper specifically measured service accessibility level among co-operative farmers; analysed co-operative and non-co-operative farmers' access to farming services; assessed the level of co-operative and non-cooperative farmers' satisfaction with co-operatives' services, and determined demographic and social-economic factors influencing farmers' satisfaction with access to Irish potato farming services. The rest of the paper is organised into theoretical and empirical framework, methodology, results and discussion, and finally, conclusion and recommendations.

2 Theoretical and Empirical Framework

2.1 Expectancy Disconfirmation Theory

This study was guided by Expectancy Disconfirmation Theory (EDT). The EDT is a theory of customer satisfaction developed by Oliver (1977) and originated from a subject of study for antecedents of satisfaction (Anderson and Sullivan, 1993). Basically, the theory was developed to measure satisfaction of customers based on difference between their expectations and experience in perceived services (Spreng and Page 2003). When the service or product offered to the customer cannot meet his expectations, negative disconfirmation arises and results in dissatisfaction (Oliver 1980). If this happens, most dissatisfied customers decide not to complain; instead, they exit the service (Osarenkhoe and Komunda 2013). The theory was used to assess whether perceived services provided by IPFCs met farmers' expectations, particularly non-co-operative members.

2.2 Empirical Review and Hypothesis Development

Access to farm inputs is one of the significant challenges expressed by both co-operative and non-co-operative farmers (Ajah 2015), which negatively impacts the overall agricultural production (Anglade et al. 2021). Several studies (Sultana et al. 2020; Abate 2018

& Ajah 2015;) report the differences between the two groups of farmers, whereas other studies revealed benefits in favour of co-operative members (Grashuis and Su 2019; Anderson et al. 2014).

A study by Ajah (2015) showed that co-operative members' access level to agricultural inputs is higher than that of non-members. Co-operative membership provides a secured market than non-co-operative farmers (Sultana et al. 2020; Giagnocavo et al. 2018), more access to loan and storage facilities (Ajah 2015), improving bargaining power of smallholder farmers and market information (Serra and Davidson 2021). In Ethiopia, Abebaw and Haile (2013) observed a positive impact of co-operative membership on fertilizer adoption. Compared to farmers who are not in cooperative, co-operative farmers are more likely to access agro-chemicals among smallholder farmers in China (Ma et al. 2018). Morfi et al. (2021) and Morfi et al. (2015) have proved a strong relationship between co-operative membership and satisfaction with farming services. The above discussion leads to the following hypotheses.

H_1: There is a significant difference between co-operative members and non-members' access to farming services.

H_2: There is a significant difference between co-operative members and non-members' satisfaction with co-operative services.

There are different factors influencing farmers' satisfaction (Barham and Chitemi 2009; Hellin et al. 2009). Some are connected with demographic factors of farmers (Ahmed and Mesfin 2017; Ma et al. 2018) and others are related to socio-economic status of farmers (Morfi et al. 2021; Ahmed and Mesfin 2017). Comparing older and younger smallholder farmers, the former are more satisfied with farming services than the latter (Lavis and Blackburn, 1990; Terry and Israel 2004). However, Elias et al. (2015) oppose Lavis and Blackburn's study, stating that older farmers are often reluctant to engage in innovative activities fearing of risk. Education background and farm size were also reported as factors that influence farmers' satisfaction (Higuchi et al. 2020; Ma et al. 2018; Bernard and Spielman 2009).

H_3 There is a relationship between demographic and socio-economic factors with farmers' satisfaction.

3 Methodology

3.1 Research Design and Target Population

The study employed descriptive design in cross-sectional study. A concurrent mixed-method approach was employed as recommended by Creswell (2009). The study was conducted in Rwanda in Northern and Western Provinces. It included four separate Districts of Musanze, Burera, Nyabihu and Rubavu. The targeted population of this study was 76 co-operatives which had 25332 members in the above Districts (NCCR 2018). For comparative purposes, non-co-operative members were also included in the study.

3.2 Sampsling Techniques and Sample Size

A multistage sampling approach was employed to select the co-operatives, their members, and non-members. In the stage one, the above Districts were selected purposively

due to their predominance in Irish potatoes farming (NISR 2017). In stage two, in selecting Irish Potato Farmer Co-operatives in the above Districts, 30% were selected as recommended by (Cooper and Schindler 2006). Hence, a sample of 23 co-operatives out of 76 was selected.

A purposive sampling technique was applied to ensure that large and small co-operatives are included in the sample. In this stage, the criterion was based on co-operative share capital, the number of active members and quantity of production. In stage three, the sample size calculation was based on Taro's (1967) formula from a population of 8096 co-operative members across 23 IPFCs (NCCR 2018). Using Taro formula, the sample size of co-operative members was computed as follows:

$$n = \frac{N}{1 + N * e^2} \tag{1}$$

where n is the sample size, N is the population size and e is the margin of error (5%).

$$n = \frac{8096}{1 + 8096(0.05)^2} = 381.17 \simeq 382$$

In stage four, the determined sample size of co-operative members was distributed to each co-operative on the basis of Probability Proportional to Size (PPS) (Appendix Table A1). PPS formula adopted according to (Kothari 2004) as presented below.

$$n_1 = \frac{nN_1}{N} \tag{2}$$

where n = determined sample size, N = target population, N_1 = total number of population in each co-operative, n_1 = number of samples in each co-operative. In selecting member respondents from the sample, a list of members in the selected co-operatives was entered into Microsoft Office Excel to make a random selection.

Concerning non-co-operative members, co-operative and village leaders have facilitated identifying Irish potato farmers who are non-co-operative members. They were selected using convenience and snowball sampling techniques. Convenience selection was used since the information was obtained from the ones readily available during data collection (Etikan 2016). Snowball sampling was also applied because some non-cooperative members have assisted in identifying others. This technique was applied to avoid bias from village leaders in identifying non-co-operative members' respondents (Naderifar et al. 2017). In computing the sample size for non-co-operative members, Cochran formula for unknown population (Cochran, 1977) was employed and obtained 167 respondents as computed below:

$$n_0 = \frac{(z_\propto)^2 pq}{e^2} \tag{3}$$

where n_0 = sample size, $z_\propto$ confidence level of 2.58, p estimated population of 0.5, q is 1-p and e is precision which was 0.05. Thus, the sample size is $n_0 = \frac{(2.58)^2 * 0.5 * 0.5}{(0.1)^2} = 167$

3.3   Instruments and Data Collection Techniques

In this study, concurrent mixed-method research was employed (Creswell 2009). Data were collected using a structured questionnaire, Key Informants Interviews (KIIs), and Focus Group Discussion (FGD). A structured questionnaire was designed to collect information from both co-operative and non-co-operative farmers on demographic and socio-economic characteristics, accessibility of farming services and their level of satisfaction with co-operative services. KIIs guide was applied to collect qualitative data from representatives of the National Co-operative Confederation of Rwanda, Irish Potato Federation, and Chairpersons of co-operative unions, Districts Co-operative Officers, Sector Executive Secretaries, and all co-operative managers. Concerning FGDs, four were conducted with Board members & Supervisory committee; two were in large co-operatives and two in small co-operatives. Each FDG was composed of five Board Members of primary co-operatives and three members of supervisory committee. Furthermore, four FGDs were conducted with co-operative members and non-members: There were two with members (one from large co-operative and one from small co-operative) and two with non-members. The ones having more ideas were excluded from individual interviews to avoid monotony and formed part of FGD.

   To ensure the quality of scales employed, it was checked whether they meet the criteria of reliability and validity. Cronbach's alpha coefficient was used for that case and the result indicated a good internal consistency of 0.876 which is above the acceptable standard of 0.7.

3.4   Analysis and Model Specification

This section discusses the methodological approaches used to describe the services offered by IPFCs, the level of satisfaction between the two groups of farmers with co-operatives' services, compares co-operative and non-members farmers' access to farming services, and analyses the factors influencing farmers' satisfaction with services provided. Descriptive statistics were used to describe the services offered. Service accessibility level among Irish potato farmers was measured by developing Service Accessibility Index (SAI). The index was derived as follows:

$$SAI = \frac{\sum_{i=1}^{t} p_i}{t * n} * N \tag{4}$$

where *SAI* is the Service Accessibility Index, p_i stands for points of a sub-service, t is the number of sub-services, n number of respondents, N is the total number of services. SAI was developed to assess whether Irish Potato farmers were able to improve their accessibility to farming services.

   The response weights were yes (1) and no (0). Thereafter, each service was allocated points, and all the points were summed to get the overall scores for service accessibility. The overall scores ranged from 0 to 23. This measure was finally divided into three categories after computing the mean score (5.3), median (5.0), minimum (1.0), and maximum scores (12). In this context, the categories were high service accessibility (5.1

to 23), moderate service accessibility (5.0), and low service accessibility (1.0 to 4.9). It has to be pointed out that the cut-off points were selected using the computed median.

In assessing the level of farmers' satisfaction, the Farmer Satisfaction Index (FSI) was developed using Factor Analysis (FA) with Principal Components Analysis (PCA) method. In developing the index, responses were assigned weights, strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1). The responses were thereafter subjected to Principal Component Analysis for data reduction. The respective weights from the set of statements were added up and divided by the number of statements that remained after data reduction to develop the index. Orthogonal Varimax (Variable Maximization) rotation was used to identify and group the causes that explain farmers' satisfaction. Variables with communalities greater than 0.5 and components whose Eigenvalue is at least 1 were selected. Finally, variables to merge were found in the Rotated Component Matrix.

$$FSI = \left(\frac{\sum_j x_{ij}}{X_m} \right) (i = 1, 2, ..., x; j = 1, 2....., m) \qquad (5)$$

where FSI is the satisfaction index, x_{ij} is the weight by respondent i to statement j on satisfaction, Xm represents the number of statements on each of satisfaction variables after PCA data reduction, and x denotes the total number of respondents.

The level of farmers' satisfaction was determined by calculating the interval size (Adel and Nahed 2016). The interval size $= \frac{5-1}{5} = 0.8$. Levels of satisfaction are presented below.

Strongly Dissatisfied	Dissatisfied	Moderately Satisfied	Satisfied	Strongly Satisfied
[1.00–1.8 [	[1.8–2.6 [	[2.6–3.4 [	[3.4–4.2 [	[4.2–5[

In comparing service accessibility and service satisfaction between the two groups, independent samples t-test was run to check if there is a significant difference between the means in two groups. After that, Eta squared and Cohen's D was applied to determine the magnitude of differences between the two groups of farmers. Eta squared ranges from 0 to 1 and indicates the proportion of variance (Lakens 2013). As proposed by Cohen (1988), this shows how it is interpreted: 0.01 = small; 0.06 = moderate; 0.14 = large magnitude.

$$EtaSquared = \frac{t^2}{t^2 + (n_1 + n_2 - 2)} \qquad (6)$$

t = t-test score, n_1 = sample size of members, n_2 = sample size of non-members. In testing the hypothesis guiding this paper, multiple regression analysis was adopted to determine factors that influence farmers' satisfaction with the services of IPFCs. Before running the model, normality of data was checked using Kolmogorov-Smirnov Test and Shapiro-Wilk Test. The test indicated that the data were not normally distributed. As recommended by Field (2009), data transformation was used to solve the problem.

Therefore, data were transformed to the natural logarithm. Moreover, Tolerance and Variance Inflation Factor (VIF) was checked to explore the presence of multicollinearity and indicated that multicollinearity was not a problem in the model.

The following model was estimated:

$$Y = \beta_0 + \sum_{i=1}^{13} \beta_i X_i + \varepsilon \qquad (7)$$

where Y denotes farmer's satisfaction which is measured in terms of five levels (Strongly Dissatisfied, Dissatisfied, Moderately Satisfied, Satisfied, and Strongly Satisfied), X_i are age, gender, household size, marital status, education qualification, primary occupation, land size, livestock ownership, savings, loan service, training, and non-livestock assets respectively, β_i are regression coefficients, and ε is the error term. Concerning description of variables as specified in the regression analysis (see Appendix Table A2). Qualitative data obtained from KIIs and FGDs were analysed using content analysis. The interview data were transcribed, sorted, and arranged in this case. Subsequently, the information obtained was coded into different themes which were further interpreted into meaningful information.

4   Results and Discussion

4.1   Demographic and Socio-economic Characteristics

Demographic and Socio-economic characteristics of heads of households are summarized in Appendix Table A3. The results indicated significant differences observed between members and non-members, such as age, dependency ratio, and others with p-values less than or equal to 0.05. It is shown that among co-operative members, most of the respondents (69%) were male, whilst 31% were female. With regard to non-members, 77% were male, whereas 23% were female. This result is roughly in accordance with what is revealed in Rwanda Co-operative Agency (2018); 60% of agriculture co-operative members were male, and 40% were female. This is because most women are involved in housework, while men are interested in remunerated work.

Concerning the age of respondents, the current study was conducted to the population with an age group ranging between 16 and 74 years. The youth population (16–30) represents 7%, while the adults (31–74) represent 93% of the total respondents. It was different for non-members, of whom 22% comprised the youth population, while 78% were adults. Many young people are reluctant to engage in agriculture activities (FAO 2018), and most of them do not own land. Co-operative members interviewed (61%) have attended at least primary school; 10% of member respondents have no formal education; only 28% have attended secondary schools, vocational training, and university. In the study area, no significant differences were observed in the level of education between the two groups. This information concurs with what was revealed by Ministry of Agriculture and Animal Resources (2018), which stated that formal education in Rwanda among farmers is still low. The majority of co-operative members (90%) in the study area are married; this is almost similar to non-members (85%). This majority is due to the fact

that agriculture is the sector absorbing the biggest part of the Rwandan population, and married people are mostly involved in farming activities, as they are responsible for survival of their families.

Regarding dependency ratio, which describes how much pressure working people face in supporting non-productive group, such as the children and elderly, it was revealed from the study area that the child dependency ratio is 98% or 98 children for every 100 co-operative members and 90.8% for non-members. Conversely, the elderly dependency ratio was 4.2% and 7% for members and non-members, respectively. This indicates that there is a little burden to support older people given that they are very few as the life expectancy is 58 years in Rwanda. It was also reported a total dependency ratio of 102.2% for members and 97.8% for non-members. This percentage still indicates how much pressure working people face in supporting the elderly and the children in the study area. The above percentages are higher than those of the World Bank (2019), which reported the child dependency ratio of 70.3% and 5% for the elderly.

4.2   Service Accessibility Level Among Farmers

As mentioned in the background section, co-operative members are expected to get an extensive range of services above what they can achieve individually at a lower cost than non-members. However, in spite of eminent benefits associated with membership in smallholder farmer co-operatives, not all smallholder farmers join co-operatives. As reported by different researchers, the reasons for not joining co-operative are linked with farmers' previous experience with co-operative mismanagement, high membership fees, which is a major limitation for poor farmers, delayed payment of members' deliveries, lack of trust for the management, meeting obligations and penalty for not showing up and not aware of membership advantages (Kayitesi 2019 & Balgah 2019). This study measured service accessibility level among smallholder farmers by employing Service Accessibility Index as presented in Table 1.

Table 1. Service accessibility level among farmers

Service Accessibility	Co-operative members access level		Non-co-operative members access level		T-test	
	Score Index	Level	Score Index	Level	T	p
Access to agricultural inputs	7.0	High	6.4	High	−5.434	.000
Access to storage facility	1.6	Low	1.4	Low	1.092	0.275
Access to Agri implements	3.4	Low	3.3	Low	−1.756	0.080

Table 1. (*continued*)

Service Accessibility	Co-operative members access level		Non-co-operative members access level		T-test	
	Score Index	Level	Score Index	Level	T	p
Access to market	13	High	13.2	High	−0.007	0.994
Access to transport	2.6	Low	3.4	Low	−2.439	0.015
Access to finance	2.2	Low	2.5	Low	−0.666	0.506
Access to land	4.8	Low	4.7	Low	−2.663	0.008
Access to market information	10.7	High	9.8	High	−1.438	0.151
Access to extension and training	2.2	Low	1.8	Low	1.436	0.152
Overall access to services					2.123	0.034

Results in Table 1 indicate that the services accessed by farmers interviewed were reported by several studies to be important in farming activities (Lepe 2016; Abebaw and Haile 2013). It is reported from the study that both groups of farmers have highly accessed agricultural inputs such as seeds, fertilizer, and pesticides, with a slight difference in favour of co-operative members. The problem remains the dissatisfaction with cost of inputs, as shown in Table 3. This is explained by small number of co-operatives licensed to sell agricultural inputs in the study area; only three co-operatives out of twenty-three are licensed to sell the inputs to farmers. Co-operative members have scored an index of 7.0, while non-members have a score index of 6.4, which implies that the difference in scores with access to inputs is significant. The results seem to corroborate with a study by Alemayehu (2008), which urged co-operatives to provide credits for agricultural inputs. Hence, members are supposed to have more access to inputs in their farming activities than non-members. However, both groups of farmers complain about the high cost of agricultural inputs compared to the income generated from selling Irish potatoes. One of the farmers in a FGD, elaborated on the issue, saying that: "*agricultural inputs are available to the market, but they are costly; in future, only large farmers will afford them. Our co-operatives fail to help us get the inputs at a reasonable price. As a result, we incur losses, and some farmers have shifted to other crops* (co-operative farmer, 18th September 2019). This caption indicates that even though agricultural inputs are available to farmers, their cost is still higher than the revenue generated for some farmers. Usually, smallholder farmers join co-operatives with the expectation to get inputs at a lower price than other sources. However, as mentioned above, few co-operatives have

managed to comply with conditions to be licensed as sellers of agricultural inputs. This has resulted in a market dominated by private traders imposing prices beyond the capacity of a smallholder farmer to afford.

Concerning storage facilities, the accessibility level for co-operative and non-co-operative members is low, 1.6 and 1.4, respectively. This witnessed a challenge for potato farming in Rwanda. Furthermore, none of the IPFCs in the study area owns cold room storage. Consequently, farmers always rush into selling with no storage option even in case of lower prices. This issue was explained by a member of the supervisory committee who said: "*As long as we do not have improved storage facilities to keep our harvests for an extended period, farmers will always be susceptible to exploitation by corrupt traders. We are incurring losses because, during harvest, we rush into selling for any price. We do not have financial capacity to construct improved storage; we need support from Government*" (Member of the supervisory committee, 14th October 2019). In KII with District Co-operative Officer (DCO), he has explained the mechanisms adopted by local Government to mitigate the problem: "*It is our responsibility to bolster co-operative sector; currently we have linked some of the co-operatives with an NGO called Post-Harvest and Agribusiness Support Project (PASP) which has agreed to support in constructing storage facilities, and the activities are in progress*" (DCO, 19th October 2019). The above findings concur with FAO (2018), which reports lack of storage facilities in Rwanda. As a result, farmers sell their production at a low price during harvest to avoid damage.

Observations from the study further show the low level of accessibility to agriculture implements amongst farmers; 3.4 score index for co-operative members and 3.3 for non-members. None of farmers owns tractors or animal traction for cultivation in the study area. In contrast to the above services, co-operative and non-co-operative members in the study area enjoy their market with 13.0 and 13.2 score indices. Extension service and training is also an issue noticed in the study area. Generally, the above findings reveal the low level of service accessibility among co-operative and non-co-operative farmers with a slight difference.

The Independent t-test for overall services in Table 1 provides the p-value of 0.034, which is less than Alpha of 0.05, leading to accept the hypothesis. There is a difference between co-operative members and non-members' access to farming services. To check the magnitude of differences, an eta test was applied and results are presented below:

Eta Squared $= \frac{-2.123^2}{-2.123^2+(394+167-2)} = 0.0080$, indicating small difference in service accessibility between members and non-members.

4.3 Service Accessibility in Co-operatives Compared with Other Sources

Multiple response analysis was used to assess the source of farming services among farmers since farmers can get services from different sources. As presented in Table 2, only 15.3% of members and 11.8% of non-members have obtained agricultural inputs from co-operatives.

Table 2. Service accessibility in co-operatives compared with other sources

Farming services	Co-operative members' access (%)		Non-co-operative members access (%)	
	From co-operative	Others sources	From co-Operative	Other sources
Access to agricultural inputs	15.30	84.70	11.80	88.20
Access to storage facility	15.20	84.80	10.45	89.55
Access to agriculture implements	0.00	100.00	0.00	100.00
Access to market	63.60	36.40	48.60	51.40
Access to transport	7.60	92.40	4.50	95.50
Access to finance	11.93	88.07	0.00	100.00
Access to land	3.70	96.30	0.00	100.00
Access to market information	61.67	38.33	44.90	55.10
Access to extension and training	33.20	66.80	0.85	99.15

This dampens members' enthusiasms from cooperatives that they have joined with the expectation of obtaining services that could not be affordable from other sources. These findings lead to agree with Lepe (2016) who recommends that farmer co-operatives should support smallholder farmers by offering an extensive range of services, including improved access to agricultural inputs.

Despite the ministerial order to sell Irish potatoes through co-operatives, as reported in Table 2, only 63.6% of co-operative members and 48.6% of non-members sell their production through co-operatives. An interviewed co-operative farmer in a FGD has given the reason saying: "*We do not sell to co-operative due to their mode of payment; most of the time they do not have enough cash to pay immediately. Consequently, we prefer selling to private traders when we urgently need money*" (Co-operative farmer" 27th September 2019). This implies limited financial capacity among IPFCs in the study area, which constitutes a serious drawback to satisfaction of members.

In some of the co-operatives, it was observed that even when they have cash at bank, cash withdrawal requires permission from a local government authority, thus delaying co-operative activities. In FGD with board members, one said: "*We are experiencing a big challenge: To withdraw our money from SACCO when we need to carry out any transaction, we are forced to get authorization from Sector Executive Secretary. This delays our activities when he is not in the office to approve. The other issue is that our co-operatives must pay through a bank account; farmers dislike this mode of payment, especially those living far from banks. Consequently, our member farmers and non-members decide to sell through private traders who are ready to pay immediately*"

(Board member, 13th October 2019). This interference of local authorities within the administration of co-operatives is a serious violation of the co-operative principle of autonomy and independence, which is a real indicator of poor management among IPFCs. Comparing both groups in terms of their source of finance, only 11.93% of members have obtained credit through their co-operatives. The results show that none has obtained credit from co-operative among non-members. This is a challenge for members to improve their production since they expect to get credit from their co-operatives at a lower cost than other finance sources. It was also observed in Table 2 that only 33.20 of members and 0.85% of non-members have accessed extension and training through co-operatives. The findings reveal that there is much more yet to be done for farmers to boost their farming practices through provision of due services in accordance with principles and objectives of cooperatives.

4.4 Satisfaction Level Among Irish Potato Smallholder Farmers

In assessing the level of smallholder farmers' satisfaction, the Farmer Satisfaction Index (FSI) was developed. The level of satisfaction was determined by calculating the interval size as mentioned in data analysis and model specification. The satisfaction with agricultural inputs was assessed by acquisition cost, quality and quantity of inputs, and timeliness.

Table 3. Satisfaction level among farmers in Northern and Western Provinces

Service satisfaction	Northern Province		Western Province		T-Test	
	Co-operative members' satisfaction level	Non-Co-operative members' satisfaction level	Co-operative members' satisfaction level	Non-Co-operative members' satisfaction level		
	Index	Index	Index	Index	t	P
Access to agricultural inputs	2.49	2.26	2.56	2.34	0.658	0.511
Access to storage facility	2.25	1.78	1.87	1.70	0.337	0.736
Access to farm infrastructure	1.73	1.18	1.68	1.25	1.524	0.129
Access to market	3.13	2.96	3.65	3.48	2.214	0.028
Access to transport	2.45	1.83	2.36	1.99	-0.374	0.709
Access to finance	1.78	1.70	2.94	2.69	-0.287	0.774
Access to land	1.72	1.64	1.91	1.78	5.529	0.000

Table 3. (*continued*)

Service satisfaction	Northern Province		Western Province		T-Test	
	Co-operative members' satisfaction level	Non-Co-operative members' satisfaction level	Co-operative members' satisfaction level	Non-Co-operative members' satisfaction level		
	Index	Index	Index	Index	t	P
Market prices	1.74	2.14	1.71	2.27	-3.067	0.002
Access to market information	3.95	3.85	3.47	3.43	3.797	0.000
Extension and training	2.41	1.79	2.64	1.62	2.503	0.013
Overall statistics	**2.36**	**2.11**	**2.48**	**2.25**	**2.657**	**0.008**

As revealed in Table 3, both groups of farmers in both provinces were dissatisfied with agricultural inputs (2.49 and 2.26 score indices for members of co-operative and non-co-operative members respectively in Northern Province compared with 2.56 score index for co-operative members and 2.34 score index for non-co-operative members in Western Province). It was observed that most farmers are dissatisfied with the availability, quality, and cost of inputs (seeds, fertilizer, and pesticides). As shown above, this issue is explained by a small number of co-operatives licensed to sell agricultural inputs in the study area. Similar to non-co-operative members, the members of co-operatives are incurring losses due to high costs and poor quality of inputs. One of the co-operative board members explained why agricultural inputs are costly and suggested the solution: "*The cost of inputs is high compared to revenues from our sales. This is due to lack of competition; only one company in our area is authorized for that business. The authority should remove barriers and allow our co-operatives to enter this business; otherwise, we will continue suffering. We are expected to sell the inputs to our members, but authorities are reluctant to authorize*" (Board member, 23rd September 2019). This implies that few companies in the study area monopolize the sale of agricultural inputs.

It is further noticed in Table 3 that smallholder farmers in both provinces were dissatisfied with storage facilities (2.25 score index for co-operative members and 1.78 score index for non-co-operative members in Northern Province compared with 1.87 score index for co-operative members and 1.70 score index for non-co-operative members in Western Province). As long as there is no intervention to avail improved storage facilities, members will always rush into side-selling to avoid damages. Concerning farm infrastructure, findings also report dissatisfaction among farmers. There are no adequate roads for easy transportation of harvests in some areas. Lack of tractors for cultivation and irrigation facilities constitutes another challenge facing Irish potato farming in Northern and Western Province. Due to the lack of an irrigation system, farmers get losses during heavy rain and drought.

In contrast to the above services, both groups of farmers were satisfied with market for their harvests. However, despite ministerial order requesting all smallholder farmers to sell through co-operatives, some farmers are reluctant, as revealed in Table 2. Several factors explained the reasons, including lack of members' loyalty to their co-operatives. The interviewed respondents said that they were forced to join co-operatives as a condition to sell Irish potatoes, contrary to the co-operative principle of open and voluntary membership (ICA 2006). As a result, most farmers lack co-operative ownership; there is no shared vision, and members are not interested in the growth of their co-operatives. It was also observed that some leaders of co-operatives in the study area sell to private traders; they all blame their co-operative for late payment.

The other factor influencing members' reluctance to sell through co-operative was due to dissatisfaction with the price, as indicated in Table 3. This dissatisfaction was explained by an interview in FGD with one of the board members, saying that: *Farmers are very dissatisfied with the prices of Irish potatoes. MINICOM sets prices, but private traders to whom we sell do not respect that ministerial order. We buy Irish potatoes from members at a price set by MINICOM and we get less than expected when we deliver them to Nzove wholesalers. We thus decide to buy from our members at a lower price to avoid big losses; some members decide to sell to private traders. Furthermore, the price set by MINICOM is low compared to what a farmer expects, considering the cost of inputs. Again, when MINICOM's price is high, private traders abstain, and co-operatives buy from farmers and, subsequently, private traders buy from the co-operatives at a lower price* (Board member, 9th October 2019). Irish potato co-operatives operate in a market like any other business where supply and demand very often dictate the price. During April, October, and November, Irish potato production becomes abundant in the market, resulting in a price decrease, which is sometimes overlooked. Generally, both groups of farmers are dissatisfied with farming services. Mainly, the cost of inputs is very high compared with the revenue earned. Consequently, some farmers in both provinces have decided to exit for other businesses. To be successful, a co-operative is expected to perform its functions and strive to provide services for improved member satisfaction (Liebrand and Ling 2014).

In comparing satisfaction between co-operative and non-cooperative farmers with farming services, the result of independent t-test in Table 3 reports the difference between the two groups. Thereafter, effect size statistics was used to determine the magnitude of differences. The results are presented below:

Eta Squared $= \frac{2.657^2}{2.657+(394+167-2)} = 0.012$. This shows a small difference between the compared groups in terms of satisfaction with co-operative services.

4.5   Regression Results

The main objective of this paper was to determine the demographic and socio-economic factors influencing farmers' satisfaction with co-operatives' services. Multiple linear regression was adopted since all assumptions required were not violated. Appendix Table A4 shows that the independent variables statistically and significantly predict the values of dependent variable, $F(13, 529) = 45.983, p(.000) < 0.05$, i.e., the regression model is a good fit of the data.

As revealed by multiple regression output, VIF used to detect multicollinearity among independent variables were less than 10, and all values of tolerance were greater than 0.1, indicating that multicollinearity was not a major problem in the model. Furthermore, results of the regression analysis in Appendix Table A4 indicates that, among demographic and socio-economic factors, only gender of household, livestock ownership, and co-operative membership significantly affected farmers' satisfaction with co-operative services, as their p value < 0.05 and primary occupation of household is significant at 10%.

The results indicate a negative and statistically significant relationship between gender of household and farmers' satisfaction with Irish potato farming services at five percent significant level (p = 0.024). As presented in Appendix Table A3, male and female respondents are 69% and 31%, respectively. Given the small number of female-headed households, the negative relationship shows that females are more effective in managing farming activities than their counterparts in the study area, considering the low level of satisfaction with co-operatives' services observed among farmers. Regarding primary household occupation, it also has a negative and significant relationship with farmers' satisfaction with Irish potato farming services at a 10 percent significant level (p = 0.098). As shown in Appendix Table A3, among heads of households, 99% practice Irish potato farming as their primary occupation. This implies that being restricted to the farming of Irish potatoes negatively affects the access to agricultural inputs since at the time a farmer experience poor production, it limits his/her ability to afford high cost of farming services for the next farming season contrary to the other farmer who adopts crop diversification. According to Elias et al. (2015), practicing off-farm activities to earn additional income helps to afford the expenses of service inputs.

The results also indicated a positive and highly significant relationship between livestock ownership and farmers' satisfaction with co-operative services at a 5 percent significant level (p = 0.010). This implies that households with livestock are more likely to get cash income easily and improve their satisfaction with farming services than non-livestock assets. This is because, apart from manure to improve soil structure and fertility, as well as water retention, farmers can also get money to buy other agricultural inputs for improved farming satisfaction. According to Jabbar (1996), cash income earned in livestock supports purchasing food and farm inputs, such as fertilizers, pesticides, and seeds.

From regression output, co-operative membership has a negative and significant relationship with farmers' satisfaction at a one percent significant level (p = 0.000). The following caption from one of the co-operative members in a FGD explained why this happened: "*Due to lack of financial capacity, our co-operatives do not provide expected services to members; we do not see any benefits from our co-operatives. At least non-members have some choices about where they can sell their harvests. Irish potato co-operatives in our areas fail because they were not formed under the principle of open and voluntary membership; most of us were forced to join these co-operatives*" (Co-operative farmer, 27th September 2019). This is simply because being a cooperative member restricts a farmer from accessing farming services from other sources when they can be obtained from co-operative. The issue especially arises when members want to sell as per ministerial order that restricts their sales to co-operatives as a sole channel, even if the price is lower than prices practiced in the mainstream market.

As shown in Appendix Table A4, loans and savings services among farmers have not significantly affected their satisfaction with co-operative services. This is due to the small number of farmers working with SACCOs and banks. Most of them opt for illegal money lenders, commonly known as Bank Lambert and solidarity tontine, which are informal and unreliable sources of finance, but effective in financing farming activities given their flexibility compared with banks and SACCOs, the latter being mostly faced with liquidity and cash flow problems to provide demand-driven services to farmers. The effect of family size is negatively insignificant, implying that less satisfied farmers have more family members than highly satisfied ones. This is because a large number of family members increases expenses to sustain the family; hence, a hindrance to satisfaction with co-operative services. Age and educational background are not the factors contributing to farmers' satisfaction. This is explained by a large number of older (93%) and a high level of illiteracy among farmers in the study area. According to Elias et al. (2015), older farmers are often reluctant to engage in innovative activities fearing of risk.

4.6   Discussion of the Results

As result of the study, the hypotheses formulated were tested. The independent t-test shows differences between co-operative members and non- members' access to farming services (H_1), leading to accept the hypothesis. Surprisingly, an eta test shows a small difference between the two groups when checking the magnitude of differences. This result does not support the previous studies by Abate (2018), Ajah (2015), and Sultana et al. 2020) who found differences between co-operative members and non-members. According to Sultana et al. (2020) and Giagnocavo et al. (2018), co-operative membership provides a more secure market than non-co-operative farmers. Co-operative members have more access to agricultural inputs, loans, storage, and processing equipment than farmers who are not in co-operatives (Ajah 2015). Co-operatives help their members to improve their bargaining power, and market information (Serra and Davidson 2021).

The study also hypothesised that there is a significant difference between co-operative members and non-members' satisfaction with co-operative services (H_2). The result shows differences between the two groups. Furthermore, eta test indicates a small satisfaction difference. The findings of this study do not conform to the study by Morfi et al. (2021) and Morfi et al. (2015) that proved a strong relationship between co-operative membership and satisfaction with farming services. Finally, in determining demographic and socio-economic factors affecting farmers' satisfaction (H_3), results indicate that gender, livestock ownership, co-operative membership, and off-farm income significantly affected farmers' satisfaction with access to co-operatives' services. In contrast, age, household size, marital status, educational qualification, land size, savings, loans, farmers' training, and no-livestock assets do not affect farmers' satisfaction.

The above result concurs with the study by Elias et al. (2015) who reported a positive and significant effect of off-farm income on farmers' satisfaction. Similar to the results of this study, Elias *et al.* further reported that age, education, and training did not significantly affect farmers' satisfaction. However, the findings of this study do not conform to the study by Higuchi et al. (2020), Ma et al. (2018) and Bernard and Spielman (2009) that reported education and farm size as socio-economic characteristics that differentiate satisfied and non-satisfied members, and Elias et al. (2015) who found that family size and credit significantly affect farmers' satisfaction.

In accordance with EDT, when actual performance of products or services does not meet customer's expectation, negative disconfirmation occurs. Findings in this study concur with what is hypothesised by EDT, because the study found that there was farmers' negative disconfirmation, as services offered by IPFCs in the study area did not meet their expectations. Consequently, as noticed, some dissatisfied farmers decided to exit Irish potato co-operatives for other businesses including a shift to other crops.

5 Conclusion and Recommendations

The results of the study show a low level of satisfaction with farming services among farmers in Northern and Western provinces. As observed, nothing can motivate non-co-operative farmers to join IPFCs in the study area since they suffer in the same way as co-operative members in accessing farming services. Nevertheless, Irish potato farmers in Western Province strive to be market-oriented compared to their counterparts in Northern Province, who mostly practice subsistence farming. In general, co-operatives in the area failed to resuscitate their activities, resulting in the exit of Irish potato farming activities for some of the farmers, as reported above. If this problem persists, it will negatively impact the overall production of Irish potatoes in Rwanda.

In the endeavour to improve Irish potato farming and enhance the level of farmers' satisfaction, it is recommended to the IPFCs, on the basis of research findings, to be market-oriented so as to be successful and provide the expected services to members. They should also mobilise their members to work closely with financial institutions to improve their farming activities. Since private traders are the ones enjoying more benefits from Irish potato farming, with government support, co-operatives are finally recommended to change their existing Irish potato market channel by taking control and management of the whole chain of distribution from farm areas through collection centers to wholesale points in the city of Kigali.

It is recommended that the Ministry of Agriculture and Animal Resources provide storage facilities with cold rooms to help IPFCs cope with price fluctuation. Furthermore, Rwanda Agriculture Board is recommended to boost up research on seeds appropriate to a specific area and support Irish potato co-operatives to enjoy the privilege of selling agricultural inputs. On the other hand, Rwanda co-operative Agency is recommended to strengthen IPFCs' capacity building for self-governance to curtail the interference by local authorities within the administration of co-operatives. To deal with inadequate Irish potato seeds, Rwanda Agriculture Board is finally recommended to use the area of *Nyagahinga* in *Butaro* for seed multiplication given its favorable soil.

The findings of this study generate facts to inform IPFCs, community development partners, and policymakers about determinants of the farmers' satisfaction with co-operative services and how they should be improved to attract non-co-operative members instead of being forced to join co-operative as a condition to sell their products. In addition, the paper contributes to the literature by analyzing farmers' accessibility to farming services and satisfaction with co-operative services in developing countries.

Appendix

Table A1. Sampled co-operatives and Probability Proportionate to Size

Province	District	Cooperative	Membership Number	Probability Proportionate to Size (PPS)	
				Members	Non members
Northern	**Musanze**	BUNYENYERI	412	19	9
		ABASERUKANASUKA	268	13	6
		KABUKA	116	5	2
		KOTEMUSHI	150	7	3
		KOJYAMUGA	95	4	2
	Burera	ISHEMA RY'UMUHINZI	205	10	4
		COAIBGI	71	3	1
		KTMKI	90	4	2
		KOUGIKA	139	7	3
		KOABINYA	65	3	1
		KOAIKAKA	99	5	2
		KOABUTA	833	39	17
		COVMB	1400	66	29
		COOPIGATE	96	5	2
Western	**Nyabihu**	KOTMUIRU	656	31	14
		KMIRJ	116	5	2
		KOAGIRU	925	44	19
		KOIKAGA	484	23	10
		KOAIGAMU	128	6	3
	Rubavu	IKEREKEZO	961	45	20
		KOKIKA	526	25	11
		KOTUGO	165	8	3
		KOABINYARU	96	5	2
	Total		**8096**	**382**	**167**

Source: Calculated from Secondary data, NCCR (2019)

Table A2. Description of variables as specified in the regression analysis

Variable Category	Variable name (X-covariates)	Variable Description
Demographic and Socio-economic and factors Farmers' Satisfaction with Access to IPFCs Services	Age	Age of respondent (in years)
	Gender	Gender of respondent (1 = male, 0 = female)
	Household size	Household size (in numbers)
	Marital status	Marital status of client (1 = married, 0 = otherwise)
	Educational qualification	Education of respondent (1 = no formal education, 6 = primary education, 12 = secondary education, 13 = vocational training, 15 = tertiary education)
	Primary occupation	Primary occupation of head of household (1 = farming, 0 = others)
	Land size	Land size used for Irish potatoes (in acres)
	Livestock ownership	Livestock ownership (1 = yes, 0 = no)
	Savings	Savings per month (1 = yes, no = 0)
	Loan service	Loan service (1 = yes, no = 0)
	Training	Training (1 = yes, no = 0)
	Membership	Co-operative Membership (1 = yes, no = 0)
	Non-livestock assets (Radio, bicycle, cell phone, TV, motorcycle, hoes, pangas, rakes, spades, axes, slashers, sickles, watering cane, wheelbarrow, ox-ploughs, chemical sprayer, manual irrigation pumps, other agricultural implements.) Access to agricultural inputs Access to storage facility Access to farm infrastructure Access to market Access to transport Access to finance Access to land Market prices Access to market information	Non-livestock assets owned by farmers (1 = yes, 0 = no) Strongly Dissatisfied [1.00–1.8[, Dissatisfied [1.8–2.6[, Moderately Satisfied [2.6–3.4[, Satisfied [3.4–4.2[, Strongly Satisfied [4.2–5[

Table A3. Demographic and socio-economic characteristics of respondents

Variable		Membership				t-test	
		Co-operative members		Non - members		t-value	p-value
		Frequency	%	Frequency	%		
Gender	Male	265	69	128	77	−1.890	0.060
	Female	117	31	39	23		
	Total	**382**	**100**	**167**	**100**		
Age	16–30	26	7	37	22	11.179	0.000
	31–74	353	93	130	78		
	Total	**379**	**100**	**167**	**100**		
Education level	No formal education	39	10	14	8	0.779	0.436
	Primary	234	61	115	69		
	Secondary	69	18	28	17		
	Vocation training	22	6	4	2		
	University	18	5	6	4		
	Total	**382**	**100**	**167**	**100**		
Marital status	Single	37	10	25	15	1.440	0.151
	Married	345	90	142	85		
	Total	**382**	**100**	**167**	**100**		
Dependency ratio	Child		98		90.87	4.246	0.000
	Aged		4.2		7	2.786	0.000
	Total		**102.2**		**97.8**	-1.116	0.095
Primary occupation of head of household	Farming of potatoes	378	99	147	88	4.384	0.000
	Other	4	1	20	12		
	Total	**382**	**100**	**167**	**100**		
Land size	< 50 acres	112	29	64	38	3.756	0.000
	[50 – 100 acres[	106	28	45	27		
	≥ 100 acres	164	43	58	35		
	Total	**382**	**100**	**167**	**100**		
Livestock	Yes	312	82	131	78	1.086	0.278
	No	70	18	36	22		

(*continued*)

Table A3. (*continued*)

Variable		Membership				t-test	
		Co-operative members		Non - members		t-value	p-value
		Frequency	%	Frequency	%		
	Total	**382**	**100**	**167**	**100**		
Savings	Yes	228	59.7	84	50.3	2.030	0.043
	No	154	40.3	83	49.7		
	Total	**382**	**100**	**167**	**100**		
Loan service	Yes	92	23.4	28	16.7	2.295	0.022
	No	302	76.6	139	83.3		
	Total	**382**	**100**	**167**	**100**		
Training	Yes	289	75.6	87	52.1	5.300	0.000
	No	93	24.4	80	47.9		
	Total	**382**	**100**	**167**	**100**		

Source: Survey Data (2019)

Table A4. Demographic and Socio-Economic Factors of Farmers' Satisfaction with access to IPFCs services

Model	Unstandardized Coefficients		Sig	Collinearity Statistics	
	B	Std. Error		Tolerance	VIF
(Constant)	2.698	0.104	0.000		
Age	−0.001	0.001	0.494	0.626	1.598
Gender	−0.052	0.023	0.024**	0.750	1.333
Household size	−0.008	0.005	0.114	0.635	1.574
Marital status	−0.002	0.034	0.961	0.843	1.186
Educational qualification	0.002	0.004	0.559	0.659	1.517
Primary occupation of household	−0.087	0.052	0.098*	0.733	1.364
Land size	0.000	0.000	0.268	0.674	1.484
Livestock ownership	0.072	0.028	0.010**	0.768	1.302
Savings	−0.015	0.019	0.410	0.979	1.022

Table A4. (*continued*)

Model	Unstandardized Coefficients		Sig	Collinearity Statistics	
	B	Std. Error		Tolerance	VIF
Loan service	−0.017	0.023	0.472	0.910	1.098
Farmers' training	−0.001	0.020	0.976	0.920	1.087
Co-operative Membership	−0.490	0.024	0.000***	0.686	1.458
Non-livestock Assets	0.080	0.109	0.446	0.538	1.860
	The good fit of regression model				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.728[a]	0.531	0.519	0.211	
	Df		F	Sig	
Regression	13	45.983	0.000[b]		

* = Significant at 10%, ** = Significant at 5%, *** = Significant at 1%

References

Abate, G.T.: Drivers of agricultural cooperative formation and farmers' membership and patronage decision in Ethiopia. J. Co-oper. Organ. Manage. **6**(2), 53–63 (2018). https://doi.org/10.1016/j.jcom.2018.06.002

Abebaw, D., Haile, M.G.: The impact of co-operatives on agriculture technology adoption: empirical evidence from Ethiopia. Food Policy **38**(1), 82–91 (2013). https://doi.org/10.1016/j.foodpol.2012.10.003

Adel, L., Nahed, A.: Measuring Farmers' Satisfaction with the Services of Agricultural Service Providers in Minya and BeniSuef Governorates, p. 48. CARE International in Egypt, Cairo (2016)

Ahmed, M.H., Mesfin, H.M.: The impact of agricultural cooperatives membership on the wellbeing of smallholder farmers: empirical evidence from Eastern Ethiopia. Agricult. Food Econ. **5**(6), 1–20 (2017). https://doi.org/10.1186/s40100-017-0075-z

Ajah, J.: Comparative analysis of cooperative and non-cooperatives farmers' access to farm inputs in Abuja, Nigeria. Eur. J. Sustain. Dev. **4**(1), 39–50 (2015). https://doi.org/10.14207/ejsd.2015.v4n1p39

Alemayehu, M.S.: Farmers' Perception on the Effectiveness of Co-operatives in Disseminating Agricultural Technologies in Ethiopia. MSc Dissertation. Sokoine University of Agriculture, Morogoro, Tanzania (2008). 102pp.

Anderson, C., Brushett, L., Gray, T., Renting, H.: Working together to build cooperative food systems. J. Agricult. Food Syst. Commun. Dev. **4**(1), 3–9 (2014). https://doi.org/10.5304/jafscd.2014.043.017

Anderson, E.W., Sullivan, M.W.: The antecedents and consequences of customer satisfaction for firms. Mark. Sci. **12**(2), 125–143 (1993). https://doi.org/10.1287/mksc.12.2.125

Anglade, B., Swisher, M.E., Koenig, R.: The formal agricultural input sector: A missing asset in developing nations. Sustainability **13**(19), 1–19 (2021)

Balgah, R.A.: Factors influencing coffee farmers' decision to join co-operatives. Sustain. Agricult. Res. **8**(1), 42–58 (2019). https://doi.org/10.22004/ag.econ.301852

Barham, J., Chitemi, C.: Collective action initiative to improve marketing performance: lessons from farmer groups in Tanzania. Food Policy **34**(1), 53–59 (2009). https://doi.org/10.1016/j.foodpol.2008.10.002

Bernard, T., Spielman, D.J.: Reaching the rural poor through rural producer organisations? A study of agricultural marketing cooperatives in Ethiopia. Food Policy **34**(1), 60–69 (2009). https://doi.org/10.1016/j.foodpol.2008.08.001

Cochran, W.G.: Sampling Techniques, 3rd edn., p. 448. Wiley, New York (1977)

Cohen, J.: Statistical Power Analysis for the Behavioural Sciences, 2nd edn. Routledge Academic, New York (1988). https://doi.org/10.4324/9780203771587

Cooper, D.R., Schindler, P.S.: Business Research Methods, 9th edn. McGraw-Hill, USA (2006). 744pp.

Creswell, J.W.: Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd edn. SAGE Publications, London (2009). 295pp. https://doi.org/10.2307/1523157

Elias, A., Makoto, N., Kumi, Y., Akira, I.: Farmers' satisfaction with agricultural extension service and its influencing factors: a case study in North West Ethiopia. J. Agric. Sci. Technol. **18**(1), 39–53 (2015)

Elias, A., Nohmi, M., Yasunobu, K., Ishida, A.: Effect of agricultural extension program on smallholders' farm productivity: evidence from three peasant associations in Highlands of Ethiopia. J. Agricultural Sci. **5**(8), 163–181 (2013). https://doi.org/10.5539/jas.v5n8p163

Etikan, I.: Comparison of convenience sampling and purposive sampling. Am. J. Theor. Appl. Stat. **5**(1), 1–4 (2016)

FAO: Global Forum on Food Security and Nutrition "Youth Employment in Agriculture as a Solid Solution to Ending Hunger and Poverty in Africa: Engaging through Information and Communication Technologies (ICTs) and Entrepreneurship". Food and Agriculture Organization (FAO): Kigali (2018). 9pp.

FAO: Strengthening linkages between small actors and buyers in the Roots and Tubers sector in Africa : Rwanda Work Plan. Food and Agriculture Organization (FAO): Kigali (2015). 15pp.

Franken, J.R.V., Cook, M.L.: Informing measurement of cooperative performance. In: Windsperger, J., Cliquet, G., Ehrmann, T., Hendrikse, G. (eds.) Interfirm Networks, pp. 209–226. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-10184-2_11

Giagnocavo, C., GaldeanoGómez, E., Pérez-Mesa, J.C.: Cooperative longevity and sustainable development in family farming. Sustainability **10**(7), 1–15 (2018)

GoR (2020). Vision 2020. Government of Rwanda (GoR): Kigali. 53pp.

Grashuis, J., Cook, M.L.: A structural equation model of cooperative member satisfaction and long-term commitment. Int. Food Agribus. Manage. Rev. **22**(2), 247–264 (2019). https://doi.org/10.22434/IFAMR2018.0101

Grashuis, J., Cook, M.L.: A structural equation model of cooperative member satisfaction and long-term commitment. Int. Food Agribus. Manage. Rev. 22(2): 247–263 (2019). https://doi.org/10.22434/IFAMR2018.0101

Grashuis, J., Dary, S.K.: Design principles of common property institutions: the case of farmer cooperatives in the upper West Region of Ghana. Int. J. Commons **15**(1), 60–62 (2021). https://doi.org/10.5334/ijc.1056

Grashuis, J., Su, Y.: A review of empirical literature on farmer cooperatives: performance, ownership and governance, finance, and member attitude. Annals of Public and Cooperative Economics **90**(1), 77–102 (2019). https://doi.org/10.1111/apce.12205

Hansen, M.H., Morrow, J.L., Jr., Batista, J.C.: The impact of trust on co-operative membership retention, performance, and satisfaction: an exploratory study. Int. Food Agribus. Manage. Rev. **5**(1), 41–59 (2002). https://doi.org/10.1016/S1096-7508(02)00069-1

Hellin, J., Lundy, M., Meijer, M.: Farmer organisation, collective action, and market access in Meso-America. Food Policy **34**(1), 16–22 (2009). https://doi.org/10.1016/j.foodpol.2008.10.003

Higuchi, A., Coq-Huelva, D., Arias- Gutiérrez, R., Alfalla-Luque, R..: Farmer satisfaction and cocoa cooperative performance: evidence from Tocache, Peru. Int. Food Agribus. Manag. Rev. **23**(2), 217–234. https://doi.org/10.22434/IFAMR2019.0166

ILO: Assessment of the potential for cooperative development in selected agriculture sectors in Ethiopia (Amhara and Sidama Regions). International Labour Organization (ILO): Ethiopia (2021). 55pp.

Jabbar, M.: Energy and the evolution of farming system: the potential of mixed farming in the moist Savannah of Sub-Saharan Africa. Outlook Agricult. J. **25**(1), 27–36 (1996). https://doi.org/10.1177/003072709602500106

Kanamugire, J.: Rwanda Irish Potato farmers decry losses as move to curb middlemen fails. The East African of Monday July 31 2017 (2017)

Kayitesi, C.: Determinants of membership and benefits of participation in pyrethrum co-operatives in Musanze District, Rwanda. Master thesis in Agricultural and Applied Economics. University of Nairobi (Kenya) (2019).81pp.

Kothari, C.R.: Research Methodology: Methods and Techniques, 2nd edn., p. 401. New Age International Publishers, New Delhi (2004)

Lakens, D.: Calculating and reporting effect sizes to facilitate cumulative science : a practical primer for t -tests and ANOVAs. Front. Psycol. 1–12 (2013). https://doi.org/10.3389/fpsyg.2013.00863

Lavis, K.R., Blackburn, D.J.: Extension clientele satisfaction. J. Ext. **28**(1), 28–56 (1990)

Lepe, M.: The role of agriculture cooperatives and farmer organizations on the sustainable agricultural practices adoption in Uganda. Master thesis in Rural Development. Ghent University (Belgium) (2016). 96pp.

Liebrand, C.B., Ling, K.C.: Member Satisfaction With Their Cooperatives : Insights From Dairy Farmers. United States Department of Agriculture (USDA) Rural Business Co-operative Programs Research Report. Washington, D.C. (2014). 24pp.

Liu, M., Min, S., Ma, W., Liu, T.: The adoption and impact of e-commerce in rural China: application of and endogenous switching regression model. J. Rural. Stud. **83**, 106–116 (2021). https://doi.org/10.1016/j.jrurstud.2021.02.021

LópezRidaura, S., Masera, O., Astier, M.: Evaluating the sustainability of complex socio-environmental systems. The MESMIS framework. Ecol. Indicat. **2**(2), 135–148 (2002). https://doi.org/10.1016/S1470-160X(02)00043-2

Ma, W., Abdulai, A., Goetz, R.: Agricultural cooperatives and investment in organic soil amendments and chemical fertilizer in China. Am. J. Agr. Econ. **100**(2), 502–520 (2018). https://doi.org/10.1093/ajae/aax079

Ma, W., Zheng, H., Zhu, Y., Qi, J.: Effect of cooperative membership on financial performance of banana farmers in China: a heterogeneous analysis. Annals of Public Cooperative Econ. 1–23 (2021). https://doi.org/10.1111/apce.12326

Marete, M.: The influence of co-operative structure on member commitment, satisfaction and success: the Murang'a nutribusiness co-operative Kenya. Doctoral dissertation. Pennsylvania University (2010). 137pp.

Mbarushimana, J.P.M.: The contribution of Irish potato collection centres in linking potato smallholder farmers to markets. A Case of Musanze District. Master Thesis in Agricultural Production Chain Management. Van Hall Larenstein, University of Applied Sciences (Netherlands) (2018). 50pp.

MINAGRI: Strategic Plan for Agriculture Transformation 2018–24: Planning for Wealth. Ministry of Agriculture and Animal Resources (MINAGRI): Kigali (2018). 235pp.

MINICOM: National Policy on Cooperatives in Rwanda: Toward Private Co-operative Enterprises Business Entities for Socio-Economic Transformation. Ministry of Trade and Industry (MINICOM): Kigali (2018). 53pp.

Morfi, C., Nelson, J., Hakelius, K., Karantininis, K.: Social networks and member participation in cooperative governance. Agribusiness **3**(2), 264–265 (2021)

Morfi, C., Ollila, P., Nilsson, J., Feng, L., Karantininis, K.: Motivation behind members' loyalty to agricultural cooperatives. In: Windsperger, J., Cliquet, G., Ehrmann, T., Hendrikse, G. (eds.) Interfirm Networks, pp. 173–190. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-10184-2_9

Mukarugwiza, E.: The hope for rural transformation: A rejuvenating co-operatives movement in Rwanda. International Labor Organization (ILO): Rwanda (2010). 22pp.

Naderifar, M., Goli, H., Ghaljae, F.: Snowball sampling: a purposeful method of sampling in qualitative research. Strides Dev. Med. Educ. **14**(3), 1–6 (2017). https://doi.org/10.5812/sdme.67670

NISR: Seasonal Agricultural Survey 2016. National Institute of Statistics of Rwanda (NISR): Kigali (2016). 114pp.

NISR: Seasonal Agriculture survey 2017. National Institute of Statistics of Rwanda (NISR): Kigali (2017). 167pp.

Oliver, R.L.: A cognitive model of the antecedents and consequences of satisfaction decisions. J. Mark. Res. 460–469 (1980). https://doi.org/10.2307/3150499

Oliver, R.L.: Effect of expectation and disconfirmation on postexposure product evaluations: an alternative interpretation. J. Appl. Psychol. **62**(4), 480–486 (1977). https://doi.org/10.1037/0021-9010.62.4.480

Osarenkhoe, A., Komunda, M.B.: Redress for customer dissatisfaction and its impact on customer satisfaction and customer loyalty. J. Market Dev. Compet. **7**(2), 102–114 (2013)

Pallant, J.: SPSS Survival Manual: A Step by Step Guide to Data Analysis Using the SPSS Program, 4th edn. Allen & Unwin, Berkshire (2011)

Prasertsaeng, P., Routrary, J.K., Ahmad, M.M., Kuwornu, J.K.M.: Factors influencing farmers' satisfaction with the activities of horticultural cooperatives in Thailand. Int. J. Value Chain Manage. **11**(1), 42–62 (2020)

RCA: Statistics on Co-operatives in Rwanda. Rwanda Co-operative Agency (RCA): Kigali (2018). pp45

Ruane, M.J.: Essentials of Research Methods: A Guide to Social Science Research. Blackwell Publishing: USA (2006). 312pp.

Seneerattanaprayul, J., Gan, C.: Effects of agricultural co-operative services on rural household welfare in Thailand. Int. Soc. Sci. J. **71**(6), 1–18 (2021). https://doi.org/10.1111/issj.12277

Serra, R., Davidson, K.A.: Selling together: the benefits of cooperatives to women honey producers in Ethiopia. J. Agric. Econ. **72**(1), 202–223 (2021). https://doi.org/10.1111/1477-9552.12399

Singh, K., Misra, M., Kumar, M., Tiwari, V.: A study on the determinants of financial performance of U.S. agricultural co-operatives. Journal of Business Economics and Management, **20**(4), 633–647 (2019). https://doi.org/10.3846/jbem.2019.9858

Spreng, R.A., Page, T.J.: A test of alternative measures of disconfirmation decision sciences. Decis. Sci. **34**(1), 31–62 (2003). https://doi.org/10.1111/1540-5915.02214

Sultana, M., Ahmed, J.U., Shiratake, Y.: Sustainable conditions of agriculture cooperative with a case study of dairy cooperative of Sirajgonj District in Bangladesh. J. Co-oper. Organ. Manage. **8**(1), 100–105 (2020). https://doi.org/10.1016/j.jcom.2019.100105

Tarekegn, M.: Factors contributing for members' satisfaction with their co-operatives: the case of co-operative in South Wollo Zone, Ethiopia. Eur. J. Bus. Manage. **9**(25), 20–28 (2017)

Taro, Y.: Statistics: An Introductory Analysis, 2nd edn., p. 919. Harper and Row, New York (1967)

Terry, B.D., Israel, G.D.: Agent Performance and customer satisfaction. J. Ext. **42**(6) (2004)

World Bank. Age dependency ratio, old (% of working age population) (2019). https://data.wor ldbank.org/indicator/SP.POP.DPND.OL. Accessed 24 Nov 2021

Zheng, H., Ma, W., Wang, F., Li, G.: Does internet use improve technical efficiency of banana production in China? Evidence from a selectivity-corrected analysis. Food Policy, **102**, 1–12 (2021). https://doi.org/10.1016/j.foodpol.2021.102044

Zheng, S., Wang, Z., Song, S.: Farmers' behaviours and performance in co-operatives in Jilin Province of China. Soc. Sci. J. **48**(3), 449–457 (2011). https://doi.org/10.1016/j.soscij.2011. 05.003