Factors Influencing the Profitability of Agricultural Cooperative Members: Case of Tuzamurane Cyeza Cooperative, Muhanga District, Rwanda

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ARTICLE INFO	ABSTRACT
  How to cite : Nzamuranmbaho, F., Ekowati, T., and Gayatri, S. 2024. Factors Influencing the Profitability of Agricultural Cooperative Members: Case of Tuzamurane Cyeza Cooperative, Muhanga District, Rwanda. Agro Ekonomi xx(x), xx-xx	This study aimed to examine the influential factors that lead to the profitability of Tuzamurane Cyeza Cooperative members in Muhanga District, Rwanda. The assessment was carried out with a survey method using 120 respondents who were selected using purposive sampling. The respondents comprised 60 cooperative members and 60 non-cooperative members who were maize farmers, while 6 local leaders and staff of Tuzamurane Cyeza Cooperative were used as key informants. Data were then collected using questionnaires and interviews, followed by assessment using profitability calculation and multiple regression analysis. The assessment was carried out to analyze the effect of the independent variables (price of maize seeds, price of fertilizers, price of pesticides, wage of labor, maize production, and land lease price) on the dependent variable (the profitability of cooperative members of Tuzamurane Cyeza). The results showed that the profitability of 60 members was 13.8%, while a value of 4.9% was obtained for non-cooperative members. The value of the F-Critical (2.26) was less than the F-calculated (7.200) and the P-value (0.009) was below the significant level (0.05). This showed that the model developed in this study could be used in predicting the contribution of independent variables to the dependent variable. This study also showed that 1 coefficient (maize production) had a positive relationship with Tuzamurane Cyeza Cooperative members, while 5 coefficients (price of maize seeds, price of fertilizers, price of pesticides, wages of labor, land lease price) had an inverse association. Based on the results, all independent variables had an impact on the profitability.

INTRODUCTION

Agricultural cooperative is an institution that facilitates the sustainability of developing countries, including Rwanda. This institution also helps to expand access to markets as well as plays an essential role in reducing poverty, improving food security, and generating employment opportunities. In

addition, cooperative is believed to help farmers in overcoming market failures (Chiyoge, 2014).

Previous studies in Ethiopia showed that cooperative farmers received higher incomes compared to non-cooperative (Getnet & Anullo, 2012). Cooperative members who had more lands, fewer children, and high education levels were reported to have higher well-being measures. A study in Kenya also described an intervention where a banana-growing cooperative provided additional benefits along with collective marketing and improved incomes. The additional benefits included access to technological innovation and extension services, which are associated with higher-value markets. Moreover, studies on welfare and well -being in Ethiopia(Ahmed & Mesfin, 2017) and Rwanda (Verhofstadt& Maertens, 2014) showed that farmers' cooperative had positive effects, but the results were not heterogeneous.

In line with these results, the objective of agriculture cooperative is simply to provide members with better prices or services, which leads to profitability. Several studies have shown that three measures are often used to determine profitability and performance(Mukamutesi, 2014). These include 1) gross sales or other indicators of business size (gross revenues, such as billings, loans, and premiums), 2) gross expenses (the difference between sales and expenses is calculated as an indicator of profitability), and total administrative/operating cost

(calculated as a percent of sales and as change over time). Cooperative also offers services to members as a means of building their capacity where farmers receive training on production methods and postharvest.

For agricultural cooperative to be profitable, several influential factors must be considered. For example, (Mukamutesi, 2014) identified certain factors influencing agricultural profitability at the farm level, including the farm gate price, government price policies, farm location, production costs, variety of seed used, yield, size, land tenure, experience in the production of crop, education level of farmers, age of farmers, household size, and distance to market. In addition, to achieve profitability, this institution must be financially stable, efficient over the long term, and have staying power, particularly to get through hard times. This is evident through different indicators, including total assets, such as the physical and financial building blocks of the business. In the daily management of agricultural cooperative, farmers tend to pursue activities that increase their income as well as reduce financial needs, physical risk, and labor requirements.

Based on existing literature, access to land, which is a major factor influencing agricultural production and its size, is also known to affect the adoption of new technologies (United Nations Food and Agriculture Organization Program., 2017). Land, as factor of production, has an essential role within agricultural sector compared to other sectors(Adenuga et

al., 2021). Investment in long-term assets, such as inputs through credits, can be made easier by the nature of land tenure with property rights. Crucial elements also include technology and technical support, market access, market information, and the achievement of specific quality and standard requirements in the handling and production processes. Access to land for Tuzamurane Cyeza Cooperative members is essential for their development, as it facilitates the procurement of secure credits and other financial support. With credits, members can easily access agricultural inputs, technology, technical assistance, services, and resources that enhance productivity and profitability for smallholder farmers (World Bank, 2018).

Tuzamurane Cyeza Cooperative started in 1998 as a group of people cultivating maize, potatoes, soya beans, and peas in Takwe marshland. Subsequently, the group evolved into cooperative in 2009 that mostly focuses on maize cultivation as well as supplies fertilizer and limes to members. The institution also provided markets for members who were mostly small-scale maize farmers. Part of the harvest obtained was used for home consumption, while the remaining portion was taken to the local nearby markets for sales. The increased harvest quantity later triggered other needs, such as stores, markets for maize, and storing facilities before selling. These needs prompted the government through the Rural Sector Support Project

(RSSP) to build a store for cooperative worth 25 million RWF (24,277.533 USD). Post-Harvest and Agribusiness Support Project (PASP) was also established, which helped members reduce post-harvest losses by providing covers. In addition, the government of Rwanda through Rwanda Agriculture Board (RAB) provided shelter and assisted with maize production, such as in the case of a disease and pest infestation.

Tuzamurane Cyeza Cooperative covers an area of approximately 100 ha in the swamps of Nzeyi, Nyagisenyi, Rubara marshland and subzones Bucyeye, Gahanga, and Nyagisenyi II marshland. The institution has a total of 1356 members, with 9 shelters, 2 stores, financial books, and financial reports. Reports have shown that the members elect their leaders through transparent elections. The general meeting attended by all members, the executive committee consists of the president, vice president, secretary, and 2 advisers, while the supervisory committee comprises the president, vice president, and secretary. After harvesting, Tuzamurane Cyeza Cooperative communicates directly to private sector companies to buy the production at premium market prices. The institution also functions as an agro dealer, as well as provides assistance in maize cultivation and marketing. Therefore, this study aims to examine factors influencing the profitability of Tuzamurane Cyeza Cooperative Members in Muhanga District, Rwanda.

METHODS

This study was conducted in Muhanga District located in the Southern Province of Rwanda which was known to have a low participation in agricultural cooperative. Furthermore, this study was conducted using the survey method, a prepared and verified questionnaire was distributed to the respondents. In this case, the target population was a total of 856 members of Tuzamurane Cooperative and 156 non-cooperative maize farmers which was located where operated. A purposive sampling method was used to determine the number of respondents to be interviewed from and non-cooperative maize farmers in Muhanga District. A sample size of 120 respondents was considered for the study and was determined by purposive sampling with inclusive and exclusive criteria.

- 60 cooperative members and 60 non-cooperative members which were maize farmers
- Location: 30 respondents each from 4 cells (Kivumu, Sholi, Nyarunyinya and Kigarama)

The study team selected 4 cells of more land of maize cultivation namely Nyarunyinya, Kivumu, Sholi, and Kigarama. 8 villages were selected from 4 cells (2 villages of more land of maize cultivation for each cell) for the study. From each cell 30 respondents and a total of 120 respondents (50% cooperative members and 50% non-cooperative members) were selected purposively as well as 6 local leaders and using the staff of Tuzamurane as key informants. A total of 8 villages were selected from 4 cells based on which had high maize production in Cyeza Sector (2 villages for every 4 cells) according to Muhanga District, department of agriculture (2019). A total of 60 selected (15 respondents each from 4) including 6 local leaders and staffs of Tuzamurane Cyeza Cooperative were selected as the key informants.

A semi-structured questionnaire administered by study teams was used for data collection. The selection of informants was based on their background, knowledge, and experience related to maize farming. Regression analysis was a tool used to analyze the influential factors that led to the profitability of cooperative members. Multiple regression analysis was used to calculate factors of the profitability of members which was the dependent variable and its independent variables (the price of maize seeds, price of fertilizers, price of pesticides, and wage of labor, land lease price, and maize production) through Statistical Package for Social Sciences.

The formula for multiple regression analysis was:

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6$$

where
Y=profitability(%)
a=constant,
b1, b2, b3, b4, b5, = regression coefficients,
X1:price of maize seeds (FRW)

X2:price of fertilizer (FRW)
X3:price of pesticide (FRW)
X4:wage of labor (FRW)
X5:maize production (Kg)
X6:land lease price (RWF)

Hypothesis
There were significant influential factors that resulted in the profitability of Tuzamurane Cyeza Cooperative members.

The statistical hypothesis for the independent F-test was:

H_0: $\sigma_1^2 = \sigma_2^2$ (There were no significant influential factors that led to the profitability of Tuzamurane Cyeza Cooperative members).
H_0: $\sigma_1^2 \neq \sigma_2^2$ (There were significant influential factors that led to the profitability of Tuzamurane Cyeza Cooperative members).
　　　　Before showing the influential factors that led to the profitability of Tuzamurane Cyeza Cooperative members, it was important to calculate the profitability of those cooperative farmers' members.

Hypothesis: Tuzamurane Cyeza cooperative member's performance was profitable

The statistical hypothesis for the independent t-test we:
Ho : μ > i (Tuzamurane Cyeza cooperative members' performance was unprofitable)
Hi : μ < i (Tuzamurane Cyeza cooperative members performance was profitable)

Since $p < .05$, the null hypothesis could be rejected and concluded that Tuzamurane Cyeza cooperative member's performance was profitable.

RESULTS AND DISCUSSIONS

Table 1: Characteristics of Tuzamurane Cyeza Cooperative farmers (n: 60)

Characteristics	Frequency (person)	Percentage (%)
Sex		
Female	32	53.3
Male	28	46.7
Age		
Valid 21-30 years old	4	6.7
31-40 years old	13	21.7
41-50 years old	24	40.0
>50 years old	19	31.7
Status		
Married	44	73.3
Single	1	1.7
Divorced	1	1.7
Widower	14	23.3
Education		
Illiterate	14	23.3
Primary	40	66.7
Undergraduate	2	3.3
Secondary	4	6.7
Number of children		
1-3	21	35.0

Continued table…..

Characteristics	Frequency (person)	Percentage (%)
1-3	21	35.0
4-7	32	53.3
Above7	4	6.7
No child	3	5.0
Cooperative Profession		
Farmers	54	90.0
Farmers & local trader	2	3.3
Farmers & handcrafter	2	3.3
Local trader	2	3.3
Cooperative Land size(ha)		
<1	14	23.3
1.1-2	23	38.3
2.1-5	20	33.3
>5	3	5.0

Source: Primary Data Analysis (2022)

Table 2: Characteristics of non-cooperative members (n: 60)

Characteristics	Frequency (Person)	Percentage (%)
Sex		
Female	15	25.0
Male	45	75.0
Age group		
21-30 years old	4	6.7
31-40 years old	13	21.7
41-50 years old	24	40.0
>50 years old	19	31.7
Status		
Divorce	2	3.3
Married	46	76.7
Single	1	1.7
Widower	11	18.3
Education level		
Undergraduate	1	1.7
Illiterate	8	13.3
Primary	46	76.7
Secondary	5	8.3
Children number		
1-3	22	36.7
4-7	27	45.0
>7	3	5.0
No child	8	13.3
Profession		
Farmers	50	83.3
Farmers& local traders	5	8.3
Farmers &handcrafters	4	6.7
Farmers & other profession	1	1.7
Tendency to join cooperative		

Continued table.....

Characteristics	Frequency (Person)	Percentage (%)
No	15	25.0
Yes	45	75.0
Land size(ha)		
<1	26	43.3
1.1-2	21	35
2.1-5	9	15
>5	4	6.7

Note: Total Production cost, total maize production, total revenue, and total income were important tools in Tables 3 and 4 to analyze the profitability of members and non-cooperative members.

Source: Primary Data Analysis (2022)

Table 3: Calculation of maize production, revenue, production cost, and profitability for cooperative members per season per season

Item	Value
Production cost (RWF)	
Organic Fertilizer cost	405,400
Inorganic fertilizer cost	944,670
Hybrid seed cost	55,860
Cultivator's cost	469,700
Harvesters	219,500
Pesticides Cost	96,500
Watchmen &other labors cost	292,050
Crop Insurance cost	67,450
Land lease cost	93,150
Total production cost (RWF)	2,644,280
Total maize production(kg)	169.92
Average price of maize/kg (RWF/kg)	180.8
Total revenue from maize (RWF)	3,010,700
Income (RWF)	366,420
Profitability (%)	**13.8**

Source: Primary Data Analysis (2022)

Table 4: Calculation of maize production, revenue, production cost, and profitability for Non-cooperative members per season

Item	Value
Production cost (RWF)	
Organic Fertilizer cost	493,940
Inorganic fertilizer cost	1,035,409
Hybrid Seeds cost	66,000
Cultivator's cost	455,500
Harvesters	212,850
Pesticides Cost	181,000
Watchmen &other labors cost	326,720
Land lease cost	16,800
Total production cost (RWF)	2788,219
Total maize production(kg)	156.95

Continued table.....

Average price of maize/kg (RWF/kg)	160.3
Total revenue from maize (RWF)	2,925,370
Income (RWF)	137,151
Profitability (%)	**4.9**

Source: Primary Data Analysis (2022)

Table 5. Independent sample t-test to analyze the profitability of Tuzamurane Cyeza Cooperative members

Test for Equality of Variances		t-test for Equality of Means		
F	Sig.	T	Df	Sig. (2-tailed)
5.997	.015	2.915	238	.004

Source: Primary Data Analysis (2022)

Profitability of Tuzamurane Cyeza Cooperative Members

Hypothesis 1: Tuzamurane Cyeza cooperative member's performance was profitable

The statistical hypothesis for the independent t-test are:
Ho: $\mu > i$ (Tuzamurane Cyeza cooperative members performance was unprofitable)
Hi: $\mu < i$ (Tuzamurane Cyeza cooperative members performance was profitable)
Since $p < 0.05$, the null hypothesis can be rejected, and conclude that Tuzamurane Cyeza cooperative member's performance was profitable.

Based on these results on the benefits of cooperative, the members of Tuzamurane Cyeza Maize Cooperative made a profit in terms of money and used it in their daily lives. The economy was growing more compared to the non-members of cooperative. Results showed that the profitability of 60 members was 13.8 as presented in Table 4. Due to their professional farming practices,

agricultural subsidies, and appropriate application of agricultural inputs, which produced higher yields, the maize crops were insured ensuring that when disasters damaged the crops, the members of Tuzamurane Cyeza cooperative could be reimbursed. Other benefits included farmers in cooperative being able to build or repair houses, buy transport means, and pay school fees for their children. For Tuzamurane Cyeza Cooperative, the price of agricultural inputs was low, members received training on agricultural production, and post-harvest and disaster-stricken farmers were reimbursed for their assistance in crop insurance. In addition, there was facilitation in collaboration with financial institution, leading to high profitability. From Table 5, the results of the t-test of Equality showed that the Sig. (.004) was less than 0.05. This allowed rejecting the null hypothesis and accepting the alternative hypothesis which stated that members' performance was profitable.

These studies were consistent with (Verhofstadt & Maertens, 2014), emphasizing that cooperative is an

instrument used to alleviate poverty and accelerate agricultural production in Rwanda. The Government of Rwanda also considered cooperative as a full partner in efforts for alleviating poverty. This institution was regarded as a pathway out of poverty by improving productivity and increasing sales of produce, thereby improving the income of smallholder's farmers.

Apart from economic profitability, cooperative had helped its members in the social sector. Rwanda was devastated by the horrors of the 1994 Genocide against Tutsi, Rwandans needed to build unity and reconciliation. Furthermore, its existence helped members rebuild trust in the aftermath of the 1994 Genocide against the Tutsi through dialogue on unity and reconciliation between the survivors and the families of those who committed the crime. The members of cooperative contributed to the annual donation of cows to the needy survivors every year.

Another important factor was giving the genocide survivor's farming credentials to ensure cropping on time. Cooperative made it easier for their members to pay premiums for health insurance schemes that were popularly referred to as "mutuelle de santé", as well as beneficial for improving food security, receiving income for better housing, access to clothing, owning livestock, and sustainably work with banks. According to (Musahara, 2017), the International Labour Organisation (ILO) identified that cooperative advocated for the disadvantaged such as the old and children, for the provision of vital financial services, to offer insurance for health hazards and life, and by pooling risk together. Consequently, there was no discrimination because different categories of people like widows, widowers, and people affected by diseases like HIV/AIDS could work together which qualified as a step towards a sustainable society. This was consistent with (Mendoza, 2016) statement that agriculture operated as an important social welfare infrastructure in remote locations, creating development opportunities and producing necessities for isolated communities.

Statistical Analysis to find out the influential factors that lead to the profitability of Tuzamurane Cyeza Cooperative Members.

Hypothesis 2
There were significant influential factors that led to the profitability of Tuzamurane Cyeza Cooperative Members.
The statistical hypothesis for the independent F-test was:
H_0: σ_1^2 = σ_2^2 (There were no significant influential factors that led to the profitability of Tuzamurane Cyeza Cooperative Members).
H_1: σ_1^2 ≠ σ_2^2 (There were significant influential factors that led to the profitability of Tuzamurane Cyeza Cooperative members).
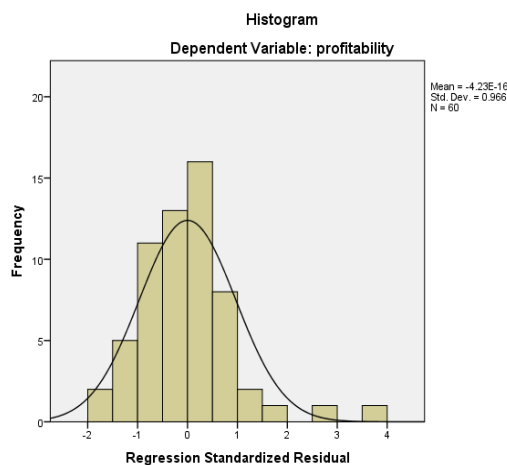
Figure 1. Normality test
Source: Primary Data Analysis (2022)

Table 6. Variance Inflation Factor (VIF)

Model	Collinearity Statistics	
	Tolerance	VIF
1 cost of fertilizer	.597	1.674
cost of hybrid maize seeds	.402	2.485
cost of pesticides	.833	1.201
cost of land	.162	6.191
maize production	.218	4.587
wages of labors	.231	4.320

a. Dependent Variable: profitability
Source: Primary Data Analysis (2022)

Classical Assumption of Regression Analysis
Normality test

A normality test was performed on residuals to observe when normally distributed. The 2 hypotheses of this test were:
Null hypothesis: Ho: The residuals were normally distributed
Alternative Hypothesis: H1: The residuals were not normally distributed.

The Bell-shaped figure showed that residuals were normally distributed. This allowed the study team to accept the null hypothesis and reject the alternative hypothesis that the residuals were normally distributed.

Multicollinearity test

A multicollinearity test was conducted as it could lead to skewed or misleading results when an analyst attempted to determine how well each independent variable could be used most effectively to predict or understand the dependent variable in a statistical model. The following table described the test of multicollinearity. The results from Table 3 showed that the cost of fertilizer, maize seeds, pesticides, land, and wages of
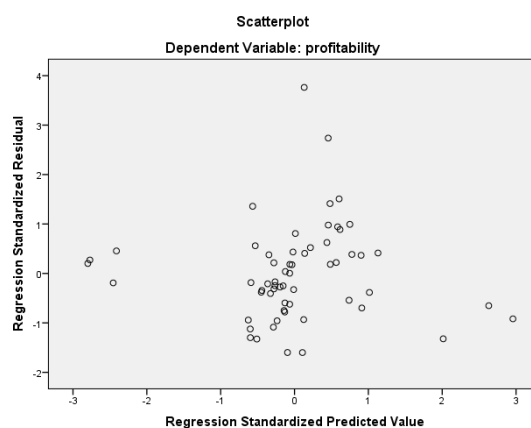
Figure 1: Heteroscedasticity
Source: Primary Data Analysis (2022)

Table 7: Coefficients of influential factors that lead to the profitability of Tuzamurane Cyeza Cooperative members.

Model	B	Std.Error	T	Sig.
(Constant)	1166.018	2175.439	.536	.593
Price of maize seeds (RWF)	-2.568	1.076	-2.38	.000a
Price of fertilizers (RWF)	-.618	.237	2.61	.010a
Price of pesticides (RWF)	-.244	.543	-.379	.034a
wage of labor (RWF)	-.345	.385	-.232	.037a
Maize production (kg)	148.348	9.211	16.10	.000a
Land lease price	-6.234	.456	-13.67	.000a

Dependent Variable: Profitability (%)

Source: Primary Data Analysis (2022)

laborers was moderately correlated while the cost of land was highly correlated with the profitability. Consequently, it was clear that the model was considered valid and correct.

Linier regression equation

Table 7 showed the coefficients of independent variables of Tuzamurane Cyeza Cooperative member's profitability From the data in Table 7, the established regression equation was:

$Y = 1166.018 - 2.568 X1 - 0.618X2 - 0.244X3 - 0.345X4 + 148.348X5 - 6.234X6$

F-test analysis

Regression results

All coefficients of the variables were found to investigate the influential factors that led to the profitability of members (Price of fertilizers, price six coefficients (wage of labor Price of maize seeds, Price of pesticides, land lease price,

Table 8. Analysis of Variance (ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	8424.231	1	8424.231	7.200	.009[b]
Residual	67860.798	58	1170.014		
Total	76285.029	59			

a. Dependent Variable: Profitability (%)
b. Predictors: (Constant), wage of labor (RWF), Price of maize seeds (RWF), Price of pesticides (RWF), land lease price, Price of fertilizers (RWF), maize production (Kg).
Source: Primary Data Analysis (2022)

Price of fertilizers, maize production) which was included in the model were significant. 2 coefficients had positive relationship with Tuzamurane Cyeza cooperative farmers, while 4 coefficients (price of maize seeds, price of pesticides, wages of labors, land lease price) exhibited inverse relationship with the farmers. The F-statistics of 7.200 which showed the marginal contribution of the coefficients was significant at 0.009 level of significance. Furthermore, the precision of the model that evaluated the influential factors was presented in Table 8.

In determining when the model was a good fit for data, the study adopted the use of ANOVA. The value of the F-Critical (2.26) was less than the F-calculated (7.200) and the P-value of 0.009 was below the significant level, implying that the model could be used in predicting the contribution of independent variables. In addition, it was true to confirm that all independent variables had an impact on the profitability. The results facilitated the acceptance of the alternative hypothesis (H1) that there were significant influential factors, leading to the profitability of Tuzamurane Cyeza Cooperative members.

T-test analysis

Based on Table 7, the results showed that there were influential factors that led to the profitability of Tuzamurane Cyeza Cooperative members. All independent variables were analyzed and described.

The relationship between the price of maize seeds and the profitability of Tuzamurane Cyeza Cooperative members

According to Table 7, the value of the significance t-test for the X1 variable (the price of maize seeds) was 0.000 (p-value < 0.05). This showed that there was a highly significant effect between the X1 variable (price of maize seeds) toward the profitability of members. Moreover, the result showed that the price of fertilizers exhibited a positive association between the maize seeds costs and profitability of Tuzamurane Cyeza Cooperative members ($\beta 1$ = -2.568). This suggested that a 1 Rwandan Franc (RWF) decrease in the price of maize hybrid seeds could lead to a 2.568 RWF increase in the profitability. When the cost of agricultural inputs decreased, the farmers gain more and obtain a high profit. Consequently,

the price of maize seeds was low due to Rwanda's policies of agricultural inputs subsidies. Tuzamurane Cyeza Cooperative attempted to get farmers to select seeds with no additional costs. Access and use of improved varieties and agriculture inputs on subsidies cost was one of the critical barriers to increased yield, improved productivity, and increased Profitability (Sibande, 2016).

The relationship between the price of fertilizers and the profitability of Tuzamurane Cyeza Cooperative members.

Based on Table 7, the value of the significance t-test for the X2 variable (the price of fertilizer) was 0.000 (p-value < 0.05), showing a highly significant effect between the X2 variable (the price of fertilizer) toward the profitability of Tuzamurane Cyeza Cooperative members. Moreover, the result showed that the price of fertilizers had an inverse relationship and significant relationship with the profitability of cooperative ($\beta 2 = -.618$), for 1 unit decrease in the price of fertilizers could lead to a 0.618RWF increase in the profitability. Fertilizers were cheap due to agricultural subsidies on inputs and had influenced Tuzamurane Cyeza maize farmers to increase profitability. Rwanda's government attempted to balance the prices of fertilizers with agricultural inputs subsidies to ensure an increase in agricultural production. This was consistent with (Sibande, 2016) stating that the move by most governments to turn into subsidies was aimed at securing food, gaining more profit, and income generating arising from agriculture.

The relationship between the price of pesticides and the profitability of Tuzamurane Cyeza Cooperative members

As shown in Table 7, the value of the significance t-test for the X3 variable (the price of pesticide) was 0.034 (p-value < 0.05), suggesting a highly significant effect between the X3 variable (the price of pesticide) toward the profitability of Tuzamurane Cyeza Cooperative members. However, the price of pesticides had an inverse relationship and significant relationship with the profitability of cooperative ($\beta 3 = -0.244$), for 1 unit decrease in the price of pesticides led to a 0.244 RWF increase in the profitability of members. The application of farm inputs enhanced the effectiveness and efficiency of human labor which in turn increased productivity (Sahel, 2016). Access and use of improved varieties as well as agriculture inputs on subsidies cost was one of the critical barriers to increasing yields, improving productivity, and increasing profitability(Sibande, 2016).

The relationship between wages of labor and profitability of Tuzamurane Cyeza Cooperative members

Based on Table 7, the value of the significance t-test for the X4 variable (wage of labor) was 0.037 (p-value < 0.05), showing a significant

effect between the X4 variable (wage of labor) toward the profitability of members. Moreover, the wage of labor had an inverse relationship with the profitability of cooperative members of Tuzamurane (β_4 = -0.345). This suggested that a 1 unit decrease in the wage of labor could lead to an increase of 0.345RWF in the profitability of Tuzamurane Cyeza Cooperative members. The contribution of agriculture to the economic development of a nation occurred in several ways including provision of employment to the uneducated and unskilled labor force (Ippmedia, 2016). Consequently, the cost of labor in Rwanda was relatively cheap. Many people were involved in the sector of agriculture so everyone needed a job in this domain. There was competition for obtaining a job where it was easy for the farmers to pay labor at a low cost and made the advantages of the profitability of Tuzamurane Cyeza Cooperative. The labor market was cheap and unskilled, and the land pressure as well as land shortage were key which boosted individuals who needed unskilled labor for agriculture (Rizzo, 2011).

The relationship between maize production and profitability of Tuzamurane Cyeza Cooperative members

Based on Table 7, the value of the significance t-test for the X5 variable (maize production) was 0.000 (p-value < 0.05), showing a highly significant effect between the X4 variable (maize production)

toward profitability of Tuzamurane Cyeza Cooperative members. However, the result showed that the maize production and profitability of Tuzamurane maize farmers had a positive relationship (β_5 = 148.348). This showed that as the maize production increased by 1 kg, the profitability also increased by 148.348RWF. Therefore, the increase in outputs led to an increment in profitability. As maize production increased, profitability also increased. The results were in agreement with (Abate et al., 2014) who noted that agricultural cooperative maintained higher levels of income and allowed small farmers to increase profits. The results were related to (Verhofstadt & Maertens, 2014), who noted that agricultural cooperative in Rwanda, aimed to boost agricultural production and improve the income of smallholder farmers by developing the markets for their produce leading to an increase in profits.

The relationship between land lease price and profitability of Tuzamurane Cyeza Cooperative members

Based on Table 7, the value of the significance t-test for the X6 variable (land lease price) was 0.000 (p-value < 0.05), showing a highly significant effect between the X6 variable (land lease price) toward the profitability of Tuzamurane Cyeza Cooperative members. Moreover, land lease price had an inverse relationship with the profitability (β_6 = -6.234). This showed that as the land lease price decreased by a FRW, the

profitability increased by 6.234 RWF. The rent price for members was 300 RWF per season, which did not further affected the profitability of cooperative's members. The government of Rwanda attempted not to tax the marshland to ensure that the price of rent did not increase. The price of agricultural land and its value were important when forming the production potential of agricultural cooperative (Nkhoma, 2015). Accordingto (Schaak & Musshoff, 2021), land was the most important factor for agricultural production. Land, as factor of production, had a vital role within agricultural sector compared with other sectors, and land leasing was a significant tool for economic development(Adenuga et al., 2021).

Adjusted R-Square test

A model summary was automatically created when running a regression modeling or a classification modeling. The following part described the model summary of the study where the coefficient of determination (Adjusted R-Square) was pointed out. This showed the level at which independent variables cause variation in dependent variables. The model summary presented in Table 9.

The major ideas relied on the fact that some influencing factors led to the profitability of agricultural cooperative. In addition, cooperative members could find profitability in the success of their cooperative in terms of social development, economic development, sustainable development, and food security. Adjusted R Square which was .973 suggesting that 97.3% of the profitability could be explained by independent variables namely wage of labor, price of maize seeds, price of pesticides, price of fertilizers, and maize production. The value of Adjusted R Square confirmed that all the independent variables together caused variation in profitability at the level of 97.3%.

Based on data gathering, members were more profitable compared to non-cooperative maize farmers. As stated by(Mukamutesi, 2014), several factors influenced agricultural profitability at the farm level. These included the farm gate price, government price policies, farm location, production costs, variety of seed used, yield, farm size, land tenure, experience in production of crop which impacts on yield, education level of the farmers, age of farmers, household size, and distance to market. In agricultural cooperative daily management in Rwanda, farmers

Table 9. Model Summary of factors influencing profitability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.987a	.975	.973	6.277

Note: Predictors: (Constant), wage of labor, price of maize seeds, price of pesticides, land lease price, price of fertilizers, maize production, dummy variables.

Source: Primary Data Analysis (2022)

tended to pursue activities that increased their income, reduced their financial cost, and physical risk, and reduced labor requirements. The low cost of organic manure in Rwanda, as well as subsidized 100% inorganic fertilizers, had increased the profitability of Tuzamurane Cyeza Cooperative members. For maize seeds, their prices were lower compared to those of non-cooperative and Tuzamurane agronomists were the ones who selected the best maize seeds. Their quality led to an increase in yield and subsequently increased profitability. Regarding the price of pesticides, the institution helped its members find variants that were effective as well as facilitated proper application. This reduced the risk of waste and increased the profitability of the farmers. Land lease price, low rent for arable land in cooperative (300RWF), was equal to 0.29USD per season which made it easier for farmers to make a profit. Lastly, for maize production, the production of members was higher than maize farmers who were not in the institution. The market for maize production was reliable and high, which increased the profitability.

CONCLUSION AND SUGGESTION

In conclusion, the influential factors that lead to the profitability of Tuzamurane Cyeza Cooperative maize farmers were examined. These results supported the idea that the members were profitable. Influential factors (Wages of labor, price of maize seeds, price of pesticides, price of fertilizers, maize production) significantly affect the profitability of Tuzamurane Cyeza Cooperative members. The results of this study supported the statement in farmers organization literature that producer cooperative was an institutional tool to improve smallholder production performance, hence, improving farm income and profitability. Although Tuzamurane Cooperative impacted positively, the level of agricultural profitability in Rwanda and Muhanga in particular was relatively low. All relevant authorities must adhere to the same target to increase the profits of farmers living in agricultural cooperative. This study recommended that barriers such as agriculture mechanization, soil studies, lime and pesticide subsidies, and introduction of agriculture banks must be addressed through the cooperation of all levels for the betterment of Muhanga District farmers particularly and Rwanda in general. Further studies needed to be conducted for the sustainable profitability of farmers's cooperative.

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