

**MOSHI CO-OPERATIVE UNIVERSITY**

**AGRICULTURAL CO-OPERATIVE BASED PROJECT ON  
FARMERS LIVELIHOOD: A CASE OF TUBURA PROJECT IN  
KOAIRWA, RWANDA**

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FARMERS LIVELIHOOD: A CASE OF TUBURA PROJECT IN  
KOAIRWA, RWANDA**

**BY**

**JEAN BERNARD ISHIMWE**

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FULFILMENT FOR THE AWARD OF DEGREE OF MASTER OF ARTS IN  
CO-OPERATIVE AND COMMUNITY DEVELOPMENT OF MOSHI  
CO-OPERATIVE UNIVERSITY - MOSHI**

**DECEMBER, 2023**

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The undersigned certify that they have read and hereby recommend for acceptance by the Moshi Co-operative University a Dissertation titled “*Agricultural Cooperative-Based Project On Farmers Livelihood: A Case of TUBURA Project in Koairwa, Rwanda*” in partial fulfilment of the requirements for the award of a degree of Master of Arts in Masters of Arts in Co-operative and Community Development of Moshi Co-operative University.

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**LIST OF ABBREVIATIONS**

AfDB	:	African Development Bank
AGRA	:	Alliance for a Green Revolution in Africa
CSA	:	Climate-Smart Agriculture
EAC	:	East African Community
FAO	:	Food and Agriculture Organization of the United Nations
ICA	:	International Cooperative Alliance.
IFAD	:	International Fund for Agricultural Development
ILO	:	International Labour Organization
KOAIRWA	:	Cooperative of Rwasave Swamp Farmers
MINAGRI	:	Ministry of Agriculture and Animal Resources (Rwanda)
MLT	:	Multiple learn regression
NAP	:	National agricultural policy
NCFC	:	National Coffee Federation of Colombia
NISR	:	National Institute of Statistics of Rwanda
NPHSCS	:	National Post-Harvest Staple Crop Strategy
OECD	:	Organisation for Economic Co-operation and Development
OHOF	:	One Health One Future
RCA	:	Rwanda Cooperative Agency
SDG	:	Sustainable Development Goals
SPSS	:	Statistical Package for Social Sciences
UNDP	:	United Nations Development Programme
USAID	:	United States Agency for International Development.
VIF	:	Variance of Inflation Factor

## ABSTRACT

The purpose of the study was to assess the TUBURA project on the livelihoods of KOAIRWA farmers in Rwanda. Employing a cross-sectional research design within the southern province of Rwanda, Huye district, the research evaluates the project's influence through a multifaceted analysis. The researcher observed the sample size of 273, and the simple random sampling technique was used. The specific objectives were to assess KOAIRWA farmers' attitude towards TUBURA project for their livelihood; to examine the implications of farming input availability, accessibility and affordability on KOAIRWA farmers' livelihood; to assess KOAIRWA farmers' livelihood before and after the intervention of the TUBURA project. The study employed both descriptive and inferential analysis that includes Multiple Linear Regression and paired sample t-test. Findings reveal that the TUBURA project garnered positive farmer attitudes, with a notable majority expressing satisfaction with the intervention, which implied that farmers have a positive attitude towards the TUBURA project since through their participation have improved their lives. The availability ( $\beta = 0.164$ ,  $p = 0.016$ ) and accessibility ( $\beta = 0.202$ ,  $p = 0.006$ ) of farming inputs, including seeds, pesticides, and fertilisers, were found to positively and significantly enhance farmers' livelihoods. In addition, the research findings indicate that the TUBURA project has had a positive and significant impact on food security, shelter, clothing, healthcare, and education access with a  $p < 0.001$ . In conclusion, TUBURA project has made a substantial and positive contribution to the livelihoods of KOIRWA farmers in Rwanda. The study recommendations span various areas, including expanding outreach and training programs to involve all co-operative members, addressing financial barriers to input affordability through government and stakeholder initiatives, and promoting a savings culture among farmers to enhance their resilience. Lastly, the study encourages farmers to diversify their livelihood activities, including engaging in small businesses.

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background to the Study

Agricultural cooperative societies play a significant role in improving the livelihoods of farmers worldwide. King (2016) observed that cooperatives originated in Europe before they spread to other industrialised countries during the late 19th century. The first agricultural cooperatives were created in Europe in the seventeenth century in the Military Frontier, where the wives and children of the border guards lived together in organised agricultural cooperatives next to a funfair and a public bath (Fontan, 2010). They spread later to North America and the other continents. They have become one of the tools of agricultural development in emerging countries. Farmers also cooperate to form mutual farm insurance societies. Also related are rural credit unions. They were created in the same period, with the initial purpose of offering farm loans. Some became universal banks, such as Credit Agricola or Rabobank (Birchall, 2014).

The author further posted that the development of these cooperatives was taken as a measure to counter extreme conditions of poverty and improve the livelihood of the farmers. One of the potential benefits of joining agricultural cooperatives should be the improvement of livelihoods to farmers. This is in line with the historical background of cooperatives, which is bringing people together to solve economic and social problems (Shirima, 2022). They are viewed as engines for transforming agriculture through which the cooperative members create employment and expand access to income-generating activities, which in turn would improve the livelihoods of the members (ICA, 2019).

According to the Food and Agricultural Organisation (FAO) (2023), agricultural cooperatives are vital to the global economy, employing over 700 million people and accounting for over 10% of the global workforce. They are especially important for smallholder farmers, who make up the majority of the world's agricultural producers.

Agricultural cooperatives have a positive impact on farmers' livelihoods in a number of ways, including increased bargaining power and better prices for products, lower input costs for seeds, fertiliser, and other supplies, improved productivity and efficiency through training and support services, access to markets and improved sales effectiveness, reduced risk and vulnerability to shocks, and improved social and

economic well-being through access to financial services, education, and healthcare (Ofori *et al.*, 2019).

In the USA, agricultural cooperatives are a vital part of the US economy, generating \$358 billion in revenue and supporting over 2.5 million jobs as of the year 2021. They also paid out \$119 billion as patronage dividends to their farmer members, helping to boost their incomes and improve their livelihoods (NCFC,2022). However, despite the positive impact of agricultural cooperatives, many farmers in the United States still face challenges in making a good living. According to a study by Burchfield *et al.* (2022), many farm operators lack key indicators of a good livelihood, such as adequate income, financial stability, and access to health insurance. Agricultural cooperatives can address the problem of low incomes and financial instability among farmers in the Providing access to affordable financing and risk management tools and helping farmers to develop new products and markets for their products (Gray,*et al* 2002).

In Africa, agricultural cooperatives play a vital role in supporting the livelihoods of millions of people. They contribute about 25% of the continent's agricultural Gross Domestic Product (GDP) and support the livelihoods of over 200 million people, or about 1/3 of the rural population. Cooperatives provide farmers with access to inputs, markets, and credit, which can help them increase their productivity and incomes. They also help to create jobs, improve food security, and reduce poverty. (International Labour Organisation (ILO, 2022).

Even with the positive impact that agricultural cooperatives have had in Sub-Saharan Africa several factors threaten farmers' livelihoods. Farmers often receive the lowest share of the consumer dollar (Warsanga and Evans, 2018). Many international aid agencies have been trying to utilise cooperatives as a strategic means for supporting farmers. They often make use of projects to fund farming operations or to finance investments. These projects bring people together and funds to provide a broad range of services, such as the provision of farm inputs to farmers (FAO, 2010).

Agricultural cooperatives are important for improving the livelihoods of farmers in East Africa. They contribute to 30% of agricultural output and 40% of agricultural exports in the East African Community (EAC). Cooperatives have also helped to increase farmers' incomes by 20%, reduce poverty by 15%, reduce food insecurity by

10%, and improve nutrition by 5%. Cooperatives provide farmers with access to credit, training, markets, and information, which helps them to increase their productivity and incomes, reduce poverty, and improve food security and nutrition (AGRA, 2021).

However, despite the positive impact of the agriculture cooperative in East Africa, farmer's livelihoods encounter many difficulties. In Tanzania, input accessibility and availability are not a big problem, but the affordability of these inputs is a critical problem due to the low livelihood capabilities of farmers. The government and other stakeholders are called to make deliberate efforts to subsidise farming inputs and provide free inputs among small-scale farmers in order to maximise outputs and profits, hence improving their livelihoods' capabilities. Kimaro *et al.* (2018).

Kenya is one of the countries with the longest history of cooperative development. The first Kenya's Co-operative Society, Lumbwa Co-operative Society, was formed in 1908 by European farmers with the main objective of purchasing fertiliser, chemicals, seeds, and other farm input and then marketing their produce to take advantage of economies of scale (Kebe, 2013).

In 1930, the Kenya Farmers Association was registered as a cooperative society to take over the role of supply of farm input played by the Lumbwa Co-operative Society (Tran *et al.*, 2021). However, despite the positive impact of the agriculture cooperative in Kenya, farmers have poor livelihoods. About 74% of their houses have a dirt floor, and only 13 percent have walls made with bricks. Few of them have access to electricity for lighting (about 5 percent), telephones (0.1 percent), or running water in the house (12 percent), and only 1.5 percent have proper sanitation facilities (a flush toilet) (Rapsomanikis, 2015).

In Rwanda, agricultural cooperatives play a significant role in improving the livelihoods of farmers. They provide farmers with a range of services, including access to affordable inputs, better markets, training and extension services, and credit. Additionally, cooperative members in Rwanda earn an average of 20% more than non-members. Cooperatives have also helped to increase agricultural productivity in Rwanda by 15% between 2018 and 2023 and create over 100,000 jobs in the agricultural sector between 2020 and 2022. (Government of Rwanda 2023).

The Cooperative Law of Rwanda (2011) recognizes the importance of agricultural cooperatives in promoting agricultural development and improving farmers' livelihoods. The law defines a cooperative as a voluntary association of persons who have joined together to achieve a common economic, social, or cultural goal through a jointly owned and democratically controlled enterprise.

In Rwanda, rice farmers face considerable difficulties in accessing credit, as banks are often reluctant to lend to them due to poor collateral. For instance, a recent study found that KOAIRWA rice farmers have no easy access to loans from banks for some members as payment can be constrained by low-income generations (Kankindi, 2019). To overcome the above problems, the government of Rwanda introduced the TUBURA Project in 2017. It is a government-led initiative aimed at improving agricultural productivity and the livelihoods of smallholder farmers through provision of improved seeds, fertilisers, pesticides, and technical assistance to enhance their agricultural practices and increase crop yields (Board, 2019).

Furthermore, the TUBURA Project is part of Rwanda's broader efforts to promote agricultural development, improve the infrastructure, achieve food security and environmental conservation (Mukuralinda *et al.*, 2020; Mutenje *et al.*, 2016). Another key component of the TUBURA project is its emphasis on empowering women in agriculture. The project recognizes the crucial role that women play in farming activities and seeks to support their participation by providing training, access to credit, and other forms of assistance. Research has shown that empowering women in agriculture can lead to increased productivity and income for households (FAO, 2011; Kaboré *et al.*, 2017). Therefore, the works of the project are in line with the livelihood framework theory which emphasises poverty reduction, access to livelihood assets and poverty reduction (Chambers and Conway (1992), Carswell (1997), Scoones (1998), Davies and Hossain (1997), and Hussein and Nelson (1998). In addition, previous studies showed that there is a positive significant relationship between agricultural cooperatives and farmers' Livelihoods (Mekonnen *et al.*, 2020). According to Zhang *et al.* (2019) found that Cooperatives played a significant role in increasing farmers' incomes, improving their access to markets and resources, and reducing their poverty. Cooperatives were more effective in improving the livelihoods of farmers in remote and less developed areas. Also, Singh *et al.* (2018) found that cooperatives were more



effective in reducing poverty in China than in India. This difference was attributed to the stronger government support and more effective management of cooperatives in China. Although these scholars have addressed agriculture cooperative based projects in different perspectives, this study tends to add knowledge towards agriculture cooperative based projects on farmer's livelihood. In the light of this, the current study intends to investigate agriculture cooperative based project on farmer's livelihood in Tubura project in Koairwa, Rwanda

## **1.2 Statement of the Problem**

Farmers in Koairwa, Rwanda, face a pressing issue. Their low income significantly hinders their ability to produce enough crops to meet their own needs and generate a sustainable income. According to a recent study by Kankindi (2019), Only 20% of farmers in Koairwa have access to fertilisers, and those who do use fertilisers often apply them at suboptimal rates. This is due to the high cost of fertilisers and the lack of access to credit. In addition to fertiliser availability, farmers in Koairwa also face a number of other challenges, including a lack of access to improved seeds and pesticides, poor infrastructure, limited access to markets, and a lack of training on modern agricultural practices. These cumulative barriers restrict farmers' access to essential resources and ultimately lead to reduced agricultural production and a detrimental impact on the livelihoods and income of the farmers. (Boani ,2013).

Several initiatives have been taken by the Rwandan government and international organisations to improve the livelihood of farmers. The Government of Rwanda (GoR) has invested significantly in the agricultural sector over the past decade and placed small-scale farmers at the centre of its agricultural policy. The government has steadily increased the budgetary allocation to agriculture from 4.2% of the national budget in 2008 to nearly 10% in 2010–2011 (Concern World, 2020). Moreover, the TUBURA project was also officially initiated in 2017 and aimed at improving agricultural productivity and the livelihoods of smallholder' farmers in the country (Board, 2019). However, despite all those efforts, the lifestyle of farmers in KOAIRWA is still low.

Furthermore, the issue of farmers' livelihoods has been a concern in the literature. Several researchers have looked upon farmers' livelihoods in different countries, to name some: Mackiman and Cumber (2018) in Ethiopia, Kimaro (2020) in Tanzania, Johns and Bown (2020) in Ghana, and Smith et al. (2018). Notwithstanding the large

volume of literature on the effect of cooperative societies on improving members' livelihood, little has been done on the assessment of agricultural cooperative societies on improving farmers' livelihoods in Rwanda. Therefore, this study aimed to fill this knowledge gap by assessing the impact of agricultural cooperative-based projects on farmers' livelihoods in Koairwa, Rwanda.

### **1.3 Objectives of the Study**

#### **1.3.1 Main objective**

The general objective of this study was to investigate the impact of TUBURA project on farmer's livelihood in KOAIRWA.

#### **1.3.2 Specific objectives**

- i. To assess KOAIRWA farmers' attitude towards the TUBURA project for their livelihood.
- ii To examine the implications of farming input availability, accessibility, and affordability on KOAIRWA farmers' livelihoods.
- iii. To assess KOAIRWA farmers' livelihoods before and after the intervention of the TUBURA project.

### **1.4 Research Questions**

- i. What is KOAIRWA farmers' attitude towards TUBURA for their livelihood?
- ii What are the implications of farming input accessibility on KOAIRWA farmers' livelihood?
- iii What is KOAIRWA farmers' livelihood before and after the intervention of the TUBURA project?

### **1.5 Justification of the Study**

The findings of this study are in line with the Sustainable Development Goals one and two. SDG 1 aims at ending poverty in all its forms while SDG aims at eliminating hunger. To achieve these two sustainable goals a continued focus on food production is paramount. Therefore, this study has been able to come up with possible plausible measures on how agriculture and livelihood capabilities among small-scale farmers can be improved in order to improve their total socio-economic status.

### **1.6 Limitations of the Study**

To conduct this research one challenge is that the questionnaire was designed in English and some of the respondents are not familiar with it. It takes a long time to

fully complete research compared to what is expected by the supervisor and the university. Limited source for literature reviews about the interventions of projects in cooperative. Which means that few articles are available at the moment, thus more are still needed

### **1.7 Organization of the Study**

The study was divided into five chapters. Chapter one of the studies covered the background information of the study, statement of the problem, research objectives, research questions, significance and limitation of the study. Chapter two involved reviewing literature concerning the study under four categories namely; Theoretical literature review, Empirical literature review, research gap and conceptual framework. Chapter three was about research methodology which involved research design, target population, sample size, sampling technique, types and sources of data, data collection method, validity and reliability issues, data analysis. Chapter four addresses the findings and discussion of the findings. Chapter five addresses the summary, conclusion and recommendations that arise from the findings of the study. Areas for further research were also included

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Definitions of the Key Terms

##### 2.1.1 TUBURA project

According to NISR (2012), TUBURA is a project designed to help small farmers in 15 districts of Rwanda access quality seeds and fertilisers. The project is run by the One Acre Fund. Its international headquarters are in Karongi District. It now employs 1,200 Rwandans. One of the primary objectives of the TUBURA project is to address the challenge of limited access to quality agricultural inputs faced by small farmers. By providing access to high-quality seeds and fertilisers, the project seeks to enhance farmers' productivity and yield. Improved access to quality inputs can result in increased crop production, improved food security, and higher incomes for participating farmers.

##### 2.1.2 Agricultural co-operative

It is a business enterprise that seeks to strike a balance between pursuing profit and meeting the needs and interests of members and their communities. Cooperatives not only provide members with economic opportunities but also offer them a wide range of services and opportunities. Agricultural cooperatives facilitate smallholder farmers' access to natural resources such as land and water, information, communication, and knowledge markets, food, and productive assets such as seeds and tools, as well as policy and decision-making (Food and Agriculture Organization of the United Nations (FAO), 2012). According to this study, an agricultural co-operative is a group of rice and maize farmers who come together to pursue common interests as regards to access to farm inputs and market.

##### 2.1.3 Farmers

Farmers are pivotal contributors to global food production and economic development (FAO, 2023). Defined by their occupation, farmers engage in activities that involve land cultivation, crop nurturing, and livestock management (Schiere *et al.*, 2021). These agricultural practitioners exhibit diverse characteristics and roles, encompassing the following dimensions:

Farmers engage in a broad spectrum of practices, spanning traditional and subsistence farming to contemporary, technology-driven agriculture. Their responsibilities include

planting, harvesting, pest control, soil conservation, and the adoption of innovative techniques to enhance yield and sustainability (World Bank, 2023). In the context of the study farmers are the members of the koairwa Co-operative who use services provided by that co-operative such as farming inputs to improve their livelihood.

#### **2.1.4 Livelihood**

The livelihood framework (UNDP, 2017) defines livelihood as the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

In the context of this study, livelihood refers to the ability of farmers to meet their basic needs and well-being through the services provided by agricultural cooperative-based projects. Such basic needs include; food, shelter, clothing, healthcare, and education.

#### **2.1.5 Farmers livelihood**

Farmers' livelihood refers to the ways in which farmers earn a living from agriculture. It encompasses the economic, social, and cultural dimensions of farming. Farmers' livelihoods are influenced by a variety of factors, including access to land, water, and other resources; agricultural policies and programs; market conditions; and climate change. Farmers' livelihoods are important for a number of reasons. First, farmers produce the food that we eat. Second, agriculture is a major source of employment and income in many developing countries. Third, agriculture plays an important role in rural economies and communities. (FAO, 2013).

In the context of this study, a farmer's livelihood is defined as the ways in which farmers earn a living from agriculture and the impact that agriculture cooperatives have on these livelihoods. This includes the economic, social, and cultural dimensions of farming, as well as the factors that influence farmers' access to resources, markets, and information. Agriculture cooperatives can play a significant role in improving farmers' livelihoods by providing them with access to resources, such as credit, inputs, and markets, and by helping them to reduce their costs and improve their bargaining power. Cooperatives can also help farmers improve their technical skills and knowledge and adapt to new challenges, such as climate change.

In numerous societies, farming is deeply rooted in cultural traditions and social structures. Farming communities often form the backbone of rural economies and significantly shape the cultural landscape of their respective regions (Schiere *et al.*, 2021). Farmers are increasingly acknowledged as environmental stewards. Sustainable and responsible farming practices are indispensable for preserving natural resources, minimising environmental impact, and addressing the challenges of climate change (World Resources Institute, 2023).

Farming methods exhibit significant regional variations influenced by factors such as climate, available resources, and technological advancements. These practices encompass a spectrum from traditional, labour-intensive methods to modern, mechanised farming (OECD, 2022). Additionally, many farmers function as entrepreneurs, managing various aspects of their agricultural operations as businesses. They make crucial decisions related to crop selection, marketing strategies, and financial management (Schiere *et al.*, 2021). In the context of the study Farmers' livelihood is the way farmers make a living from agriculture. It includes the economic, social, and cultural aspects of farming. The study looks at how agriculture cooperatives have affected all of these aspects of farmers' lives in the Tubura region of Rwanda.

## **2.2 Theoretical Review**

### **2.2.1 Livelihood Framework**

Livelihood analysts, as represented by scholars such as Chambers and Conway (1992), Carswell (1997), Scoones (1998), Davies and Hossain (1997), and Hussein and Nelson (1998), have articulated a comprehensive definition of livelihoods that underscores the intricate interplay of various dimensions. This perspective conceptualises livelihoods as a holistic construct encompassing a multitude of factors, including assets (natural, physical, human, financial, and social capital), activities, and the access individuals or households have to these components, all of which collectively determine the means by which people sustain their lives (Ellis, 2000). This multidimensional approach acknowledges that the inability to access these fundamental aspects of life can result in exclusion from societal participation due to the constraints on an individual's ability to function and make choices, echoing Amartya Sen's concept of capability deprivation (Sen, 1999). Within this livelihood framework, it becomes evident that people's

engagement with and access to the necessary assets are profoundly influenced by organisational structures.

Organisations are instrumental as mediating agencies in the intricate process of accessing livelihood assets. They act as intermediaries that facilitate the connection between individuals or households and the resources they need to secure their livelihoods. In this context, the concept of agricultural cooperatives emerges as a particularly relevant illustration of these mediating agencies. Agricultural cooperatives play a significant role in bridging the gap between development projects and farmers by functioning as intermediaries that facilitate access to essential resources.

The livelihood framework's utility becomes evident when examining the role of agricultural cooperatives within it. These cooperatives can be seen as mechanisms that contribute to the enhancement of farmers' livelihoods by serving as platforms that organise, pool, and channel various assets and resources. By leveraging their social capital and collective strength, agricultural cooperatives offer a structured avenue for farmers to collectively access inputs, knowledge, credit, markets, and other critical elements that contribute to their overall well-being. These cooperative structures mediate the interaction between farmers and development projects, enabling a more effective and targeted delivery of interventions, resources, and knowledge.

Incorporating the insights from the livelihood framework into the context of agricultural cooperatives enriches our understanding of their significance in the development landscape. These cooperatives operate as the nexus through which the assets mentioned in the livelihood framework flow to individuals and households, playing a pivotal role in determining the effectiveness and sustainability of livelihood-enhancing interventions. By creating a conduit for access and collaboration, agricultural cooperatives contribute to empowering farmers, promoting collective agency, and fostering the development of human capabilities. This not only reinforces the positive impact of projects like the TUBURA project on farmers' livelihoods but also highlights the essential role of intermediary organisations like cooperatives in translating development initiatives into tangible improvements in people's lives. However, this theory only focuses on livelihood but does not cater for co-operatives yet the existence and sustainability of co-operatives directly affects the livelihood of its members. Co-operatives like other business organisations like companies' operative

from an environment that is volatile in terms of changing customer needs and preferences. Therefore, this study adopted the neoclassical theory of agricultural cooperatives which highlights the fundamental economic questions of what to produce, when to produce, for whom to produce, where to produce from and how much to charge.

### **2.2.2 Neoclassical Theory of Agricultural Cooperatives**

This study was also guided by the Neoclassical Theory of Agricultural Cooperatives, a theory developed by Danziger and Coate (1970) and Shepherd (1960). The Neoclassical Agricultural Cooperative Theory aims to understand the economic behaviour of agricultural cooperatives by applying neoclassical economic principles such as marginal analysis to derive conclusions about how cooperatives operate in various market structures. Cooperatives, like any other business organisation, face a variety of economic decisions, such as how much to produce, what price to charge for their products or services, and how to allocate resources. Neoclassical economic principles, such as marginal analysis, can be used to model these decisions and predict how cooperatives will respond to changes in market conditions (Rojas ,2022). The theory has been applied by researchers in various fields, including cooperatives, marketing power, and agriculture

The theory is based on the assumption that agricultural cooperatives function as profit-maximising entities, similar to traditional firms. However, it also acknowledges the unique features of cooperatives, such as member control and patronage refunds, which influence their decision-making processes.

The Neoclassical Agricultural Cooperative Theory assumes that cooperatives have various objectives, including maximising member returns, maximising output, minimising average cost, and maintaining open membership. The theory enables us to understand how cooperatives make decisions in pursuit of profit maximisation while considering their unique characteristics. (Royer, 2014).

The theory allows for the study of how cooperatives impact farmers' livelihoods, exploring aspects such as improved incomes, strengthened market access, promotion of innovation and technology adoption, and empowerment through collective action. Strengths of the Neoclassical Theory of Agricultural Cooperatives Provides valuable



insights into the expected behaviour of cooperatives in different market structures. Highlights differences in behaviour between cooperatives and investor-owned firms (IOFs) and Useful for understanding the economic implications of a cooperative's choice of objectives and aids in developing consistent business strategies (Jeffrey, 2013). The theory is relevant to understanding how cooperatives contribute to improving farmers' livelihoods by maximising member returns, reducing costs, strengthening market access, promoting innovation, and empowering farmers through collective action. The neoclassical theory can be used to analyse the Tubura Project's behaviour and assess its alignment with neoclassical predictions The theory sheds light on how the project's objectives may influence its economic behaviour. Discussion on the roles of managers, boards, and members can inform the project's governance structure.

## **2.3 Empirical Review**

### **2.3.1 Farmers' attitude towards TUBURA Project**

Nyairo (2020) explored the attitudes and perceptions of smallholder farmers towards agricultural technologies. He used quantitative and qualitative approaches. He used a survey questionnaire and focus groups to collect data. The study found that some of the farmers spoke highly of the benefits of using newer fertilisers and hybrid seeds, while others entirely doubted the effectiveness of the inputs. Farmers feel that these people who come up with new farming inputs have some of those inputs untested but still introduce them to farmers. Farmers are even afraid to use them. The study Concludes that The adoption of agricultural technologies by smallholder farmers is a multifaceted process that is influenced by numerous factors. Understanding farmers' perspectives and attitudes is crucial for designing effective strategies to encourage the adoption of new technologies. Extension services can significantly contribute to promoting technology adoption by providing farmers with comprehensive information and training. Building on Nyairo's (2020) insights on understanding of the attitude of farmers towards technology adoption in agricultural co-operatives, the current study aimed to assess farmers' attitudes toward the TUBURA project.

Farouque *et al.* (2018) carried out a study aiming to determine small-scale farmers' attitudes towards the OHOF approach for their livelihood improvement and to identify the problems faced by the farmers in adopting the OHOF approach. The study was

carried out in two upazilas in the Sherpur district of Bangladesh. Data were collected from a sample of 200 farmers. Farmers' attitude toward each statement was measured using a five-point Likert scale. The findings revealed that 66% of the farmers had a favourable to highly favourable attitude, 28% had an unfavourable to highly unfavourable attitude, and only 6% had a neutral attitude towards the OHOF approach. This study is functional for the current study, which will adopt the same measurements for farmers' attitudes. Informed by Farouque *et al.*'s (2018) study, the current research adopted similar measurements to assess small-scale farmers' attitudes.

The study conducted by Jones and Brown (2020) aimed to explore farmers' perceptions of a cooperative-based project in Ghana, specifically the TUBURA Project, and its impact on smallholder farmers' livelihoods. Through their qualitative research design, the study provided valuable insights into the importance of understanding farmers' attitudes towards such projects in promoting successful implementation and positive livelihood outcomes. The use of purposive sampling and in-depth interviews in the local language allowed for a deep understanding of the participants' experiences and perceptions. The study's findings suggest that farmers who perceive cooperative-based projects as beneficial and aligned with their needs are more likely to actively participate and experience positive changes in their livelihoods. Thus, the study highlights the need for project evaluators to consider farmers' attitudes and perceptions when assessing project success and designing interventions that are tailored to their needs. Informed by Jones and Brown (2020) underscores the significance of understanding farmers' attitudes towards cooperative-based projects, aligning with the current study's focus on assessing KOAIRWA farmers' attitude towards the TUBURA project.

Oluwasusi, (2014) Investigated the attitude of vegetable farmers toward organic agriculture practices in South West Nigeria and the determinants of their attitude. Cluster sampling was used to select 315 farmers from a list obtained from the farmers' cooperative societies. Farmers were interviewed in person. Attitude was measured as a pooled score of respondents' responses to 25 positive and negative statements made on a five-point Likert scale. Data was analysed using frequency counts, percentages, means and a probit regression model. A majority of the farmers had a positive attitude toward organic agriculture practices. The most important attitudinal statement ranked

by the farmers was that organic agriculture strengthens the use of indigenous knowledge (4.55). The results of the probit model revealed that farm size, farming experience, household size, membership of organisation and sources of information ( $t = 0.254, 0.089, 0.125, 0.694, 0.021, p < 0.01$ ) respectively showed a positive relationship with attitude toward organic farming practices. Therefore, there is a need for effective linkage of research systems with extension services on relevant organic practices, as a build up to traditional farming, adaptable and sustainable to local conditions of vegetable farmers. This study is functional for the current study which will adopt some measurement for farmer's attitude.

The study by Agyei and Atta-Krah (2021) explored the attitudes and perceptions of smallholder farmers towards climate-smart agriculture (CSA) in Ghana. The study used a mixed-methods approach, involving a quantitative survey of 200 farmers and focus group discussions with 24 farmers. The study found that farmers had a positive attitude towards CSA technologies, but they had limited knowledge about CSA and faced a number of challenges in adopting CSA technologies, such as lack of access to information and training, financial constraints, and risk aversion. The study recommends that policymakers and development practitioners focus on increasing farmers' access to information and training on CSA technologies, as well as providing financial and other support to help farmers adopt CSA technologies. In addition to the recommendations in the study, it is also important to address the gender constraints that prevent women farmers from adopting CSA technologies. This can be done by providing women farmers with equal access to land, resources, information, and training. Overall, the study highlights the importance of understanding the attitudes and perceptions of smallholder farmers towards CSA in order to develop effective policies and programs that support the adoption of CSA technologies.

The alignment by Agyei and Atta-Krah's findings and the current study underscores the critical role of positive farmer attitudes, knowledge enhancement, and financial support in the success of agricultural interventions, thereby informing the investigation of the Tubura project's impact on Koairwa farmers' livelihoods and their attitudes towards the TUBURA project.

The study by the Rwanda Agriculture and Food Security Board (2022) on farmers' attitudes towards the TUBURA project used a quantitative research methodology. The

study surveyed 300 farmers in five districts, using a structured questionnaire to collect data on their satisfaction with the project, its impact on their livelihoods, and their knowledge of sustainable agricultural practices. The study found that 90% of farmers were satisfied with the TUBURA project, and 85% said that it had improved their livelihoods. The study also found that farmers who participated in the project were more likely to use sustainable agricultural practices and had a better understanding of climate change and its impacts on agriculture. The study recommended that the TUBURA project continue to provide training and support to farmers on sustainable agricultural practices and climate change adaptation. The study also recommended that the project expand its reach to more farmers across Rwanda. The review's findings inform current study further reinforces the positive influence of the TUBURA project on farmers' attitudes, livelihoods, and various aspects of well-being, thereby providing a comprehensive assessment of the project's effectiveness in enhancing the livelihoods of KOAIRWA farmers.

The TUBURA project has had a positive impact on farmers' attitudes towards the project, their livelihoods, and their knowledge of sustainable agricultural practices. The current study focused on assessing the impact of the TUBURA project on farmers' livelihoods.

### **2.3.2 Farming inputs availability, accessibility and affordability**

Rwirahira (2009) conducted a situational analysis with the main objective of providing a reliable situational analysis of the Rwandan agricultural sector and to recommend interventional strategies that would enable the government and her development partners to come up with sustainable interventions aimed at addressing the identified challenges. The policy documents of MINAGRI and other associated agencies were reviewed, including their strategies and business plans. Key stakeholders in the agriculture sector were interviewed. The result shows that there was little use of modern technology and a low use of fertiliser, improved seeds, and pesticides due to a combination of a shortage of supply, poor distribution networks, a lack of knowledge and skills, affordability, and a lack of incentives. The review identified the lack of modern technology, fertiliser, improved seeds, and pesticides as key challenges facing Rwandan farmers. This information helped the current study to assess the impact of the TUBURA project on the availability and accessibility of these inputs.

Kimaro *et al.* (2018) investigated the implications of livelihoods' capabilities on coffee farming inputs among small-scale farmers in Hai and Arumeru Districts, Tanzania. A study used a cross-sectional research design. The study used both primary and secondary data. Data collection tools included a questionnaire, a focused group discussion guide, a key informant guide, and an observation guide. The study used purposive sampling and simple random sampling techniques. It was found that livelihoods' capabilities among small-scale farmers are among the aspects influencing coffee farming input availability, accessibility, and affordability by impairing their abilities to get adequate and quality farming inputs. Farming inputs were measured by considering access, availability, and affordability. These measurements were employed in this study. This information helped the current study to assess the impact of the TUBURA project on the availability, accessibility, and affordability of farming inputs for KOAIRWA farmers

Nkurikiye (2016) conducted a prospective study looking at resource use in rice cooperatives in Rwanda. The study aimed to describe and compare levels of technical efficiency and farm management practices among smallholder rice producers from four rice cooperatives in the Bugarama Rice Scheme. Data were collected on 139 farmers. Descriptive analysis was used. Results indicated that erosion, floods, and pest and disease incidences heavily hampered rice production activities. The research also found that there was a need for strengthening extension services in cooperatives and supplying farming inputs such as fertilisers, pesticides, and certified seed through cooperatives. The alignment between Nkurikiye's findings on the importance of strengthening extension services and providing farming inputs, and the positive outcomes of the TUBURA project,

Abebe *et al.* (2017) conducted a randomised controlled trial with 600 smallholder farmers in the Amhara region of Ethiopia to evaluate the impact of improved seeds and fertiliser on crop yields. The study found that farmers who had access to these resources had significantly higher yields compared to those who did not, highlighting the potential for these interventions to improve food security and livelihoods for smallholder farmers. The study contributes to addressing the knowledge gap on the effectiveness of these interventions and emphasises the importance of rigorous research methods, such as randomised controlled trials, to evaluate the impact of

agricultural interventions. The findings of the Abebe et al. study provide a strong foundation for the current study on the TUBURA project. The evidence from the Abebe et al. study supports the notion that access to improved agricultural inputs, such as seeds and fertiliser, can have a positive impact on crop yields and farmer livelihoods. This finding underscores the importance of the TUBURA project in providing these essential inputs to KOAIRWA farmers. Additionally, the methodological approach of the Abebe et al. study serves as a model for the current study, emphasising the need for rigorous and systematic research to assess the effectiveness of agricultural interventions.

Kiptot and Franzel (2014) conducted a study in the Kenyan highlands, focusing on smallholder farmers, to investigate the impact of technical assistance on the adoption of sustainable agricultural practices. Through a combination of quantitative and qualitative methods, including surveys, focus group discussions, and interviews, the researchers collected data on farmers' socio-economic characteristics, farming practices, and adoption of sustainable practices. The study found that farmers who received technical assistance were more likely to adopt improved farming techniques and achieve higher productivity. This research addresses a knowledge gap regarding the influence of technical assistance on sustainable agriculture among smallholder farmers and emphasises the importance of targeted interventions and support to enhance farming practices and improve the overall well-being of farmers in the region. The findings from kiptot and franzel it is important for the current study because it can help to ensure that the TUBURA project is sustainable in the long term.

A study by the International Food Policy Research Institute (2022) found that farmers in developing countries have limited access to farming inputs such as seeds, fertilisers, and pesticides. The study, which surveyed 10,000 farmers in 10 countries, found that only 50% of farmers had access to all of the farming inputs they needed. The study also found that farmers who had access to farming inputs were more likely to have higher yields and incomes. The study estimated that if all farmers had access to the farming inputs they needed, agricultural productivity in developing countries would increase by 15%. The study used a quantitative research methodology. The study surveyed 10,000 farmers in 10 countries, using a structured questionnaire to collect data on their access to farming inputs, their yields, and their incomes. The study's

recommendations can help improve farmers' access to farming inputs and increase agricultural productivity in developing countries. Governments and development organisations should work to implement these recommendations in order to improve the livelihoods of farmers and ensure food security for all.

The study by the World Bank (2020) on the lack of access to farming inputs in developing countries used a quantitative research methodology. The study collected data on farmers' access to farming inputs, their yields, and their incomes from a variety of sources, including surveys, interviews, and government records. also used economic modelling to estimate the impact of farming input accessibility on agricultural productivity and incomes. The study also found that farming input accessibility has a positive impact on agricultural productivity and incomes. Farmers who have access to farming inputs are more likely to have higher yields and incomes, and it is recommended that the government should provide farmers with subsidies or vouchers to purchase farming inputs, improve the infrastructure to transport farming inputs to rural areas, establish input markets where farmers can purchase farming inputs at competitive prices, educate farmers about the importance of using farming inputs and how to use them effectively, and support the development of farmer groups and cooperatives to improve farmers' bargaining power and access to markets.

A study by the International Food Policy Research Institute (2021) surveyed over 10,000 farmers in 10 developing countries to assess the affordability of farming inputs. use quantitative research methods such as surveys and interviews to collect data on farmers' costs and income, as well as their access to and use of farming inputs. The data is then used to estimate the affordability of farming inputs for different groups of farmers. The study found that the cost of farming inputs increased by 40% between 2006 and 2020, while farmers' incomes only increased by 20% during the same period. This led to a significant decline in the affordability of farming inputs for many farmers, and the study recommends that governments and development organisations should take steps to address the specific factors that are driving the high cost of farming inputs in different countries. For example, in countries where the cost of fertiliser is high, governments can subsidise the cost of fertiliser or provide farmers with access to low-cost fertiliser alternatives.

Study by Minot and Nicolous (2016) on the Impact of Access to Farming Inputs on Farmers' Livelihoods in Sub-Saharan Africa The study used a quantitative survey of 1,000 farmers in 10 countries to assess the impact of access to farming inputs on farmers' livelihoods. The study found that farmers with access to farming inputs had higher yields and incomes than farmers without access to farming inputs. The study's findings suggest that improving farmers' access to farming inputs is a key strategy for improving their livelihoods in Sub-Saharan Africa. Governments and development organisations can play a role in improving farmers' access to farming inputs by investing in input markets, subsidising inputs, and supporting programs that help farmers access credit.

Study by Otieno and Wambaa (2022) on the Impact of Agricultural Cooperatives on Farmers' Access to Farming Inputs and Livelihood in Kenya The study used a quantitative survey of 500 farmers, both cooperative members and non-members, and found that cooperative members in Kenya had better access to farming inputs, such as fertiliser and seeds, than non-members. Cooperative members also had higher yields and incomes than non-members. The study concluded that cooperative membership helped farmers reduce their input costs and improve their livelihoods, and it recommends that governments and development organisations support the development of agricultural cooperatives and encourage farmers to join cooperatives. This can help improve the livelihoods of farmers and contribute to rural development.

### **2.3.3 Livelihood**

Nabahungu and Visser (2011) conducted a study to determine the contribution of wetlands to farmers' livelihoods; socio-economic information on agricultural management and production systems and household characteristics was required. Simple random sampling was used. A survey questionnaire and interview were used to collect data. Qualitative and quantitative data were collected. The study found that the main source of income for households in both was the sale of crop and livestock products. Other sources of income included craft work, construction/masonry, bicycle repairs, and selling their labour on other farms. Informal trade was an important source of income for some women. Household income was spent on school fees for children, medical services, and basic household needs such as salt, sugar, soap, and clothing. the



empirical review provides support for the current study's findings and suggests that the TUBURA project is an effective way to improve the livelihoods of farmers in koairwa

Kimaro (2020) analysed the influence of livelihood capabilities on coffee production among small-scale coffee farmers in Hai and Arumeru 2 farming inputs availability, accessibility, and affordability. A cross-sectional research design using a mixed-methods approach was applied. Qualitative and quantitative data were collected. Content analysis and trend analysis were employed. The results indicated that the small-scale coffee farmers were categorised into four capability levels: no capability (9.2%), low capability (39.2%), moderate capability (18.4%), and high capability (33.2%), respectively. The livelihood capability was determined by considering nine indicators: ability to eat three meals per day, quality of housing, ability to have quality clothes, ability to pay for medical services, any household member being salaried or self-employed, ability to pay for school fees timely, ability to own livestock, ability to own private transport (bicycle, motorcycle, or car), and ability to own a trade or business. These indicators were adopted by the current study.

Nabahungu and Visser (2011) conducted a study on the contribution of wetland agriculture to farmers' livelihoods in Rwanda. The goal was to analyse factors that contribute to the livelihood of smallholder farmers living in the vicinity of the Cyabayaga and Rugeramigozi wetlands. Focus group discussions and surveys were used to collect data. Field size, status of soil fertility, and input use are also key factors determining the level of contribution that wetland agriculture makes to farmers' livelihoods. The study found that rice was the largest contributor to household income, providing on average \$1045 per household per season in Cyabayaga. The Nabahungu and Visser study found that interventions that support farmers in increasing their agricultural productivity and diversifying their livelihoods are likely to have a positive impact on their livelihoods. The current study confirms these findings and also found that interventions that address a range of livelihood needs, such as food security, healthcare, and education, are also likely to be beneficial.

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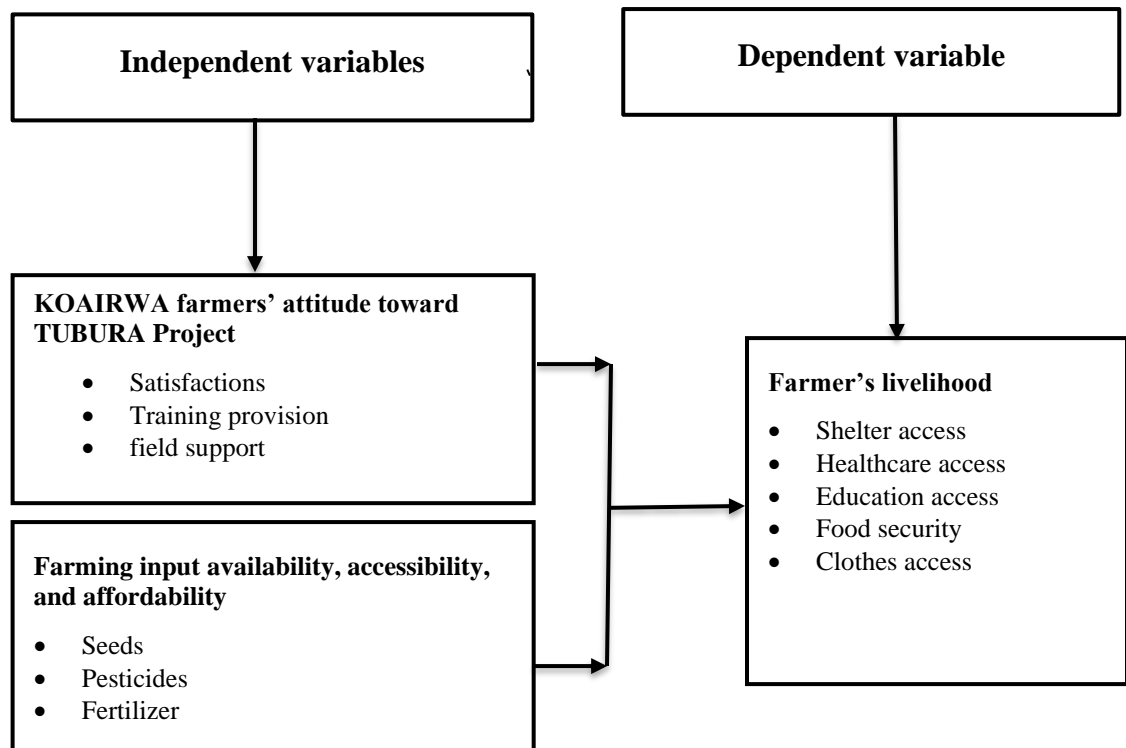
The research was conducted by the African Development Bank in 2021 on the impact of agriculture cooperatives on the livelihoods of farmers in Rwanda. The study used a mixed-methods approach, combining quantitative and qualitative data. The quantitative data was collected from a survey of 500 farmers. The qualitative data was collected from interviews with key stakeholders, including agriculture cooperative managers, government officials, and farmers. The study found that cooperative membership has a positive impact on the livelihoods of farmers in Rwanda.

Agriculture co-operative members have higher incomes, higher savings rates, and are more likely to use improved agricultural practices than non-members. The study also found that agriculture cooperatives help farmers reduce their risk exposure and improve their financial resilience. The study recommended that the Rwandan government and development organisations should support the development of agriculture cooperatives and encourage farmers to join such cooperatives.

Review of extant literature has highlighted that most studies that have been conducted on the influence of co-operatives on the livelihood of their members have tended to focus on farm inputs. However, this study will also focus on influence of field support, training in addition to farm inputs to elaborate on the influence of co-operatives on farmers' livelihood.

#### **2.4 Conceptual Framework**

The conceptual framework explains the relationships that exist between independent variables and dependent variables in the assessment of agricultural cooperative-based projects on farmers' livelihoods. The independent variables include KOAIRWA farmers' attitude towards the TUBURA project for their livelihood, farming input availability, accessibility, affordability, and farmer's livelihood before and after the intervention of the project, and the dependent variable includes farmer's livelihood.



**Figure 1: Conceptual framework**

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Research Design

In this study, a cross-sectional research design, as advocated by Thomas (2023), was employed to gather valuable insights into the research questions at hand. A cross-sectional research design is a robust methodological approach, frequently used in social science research, that enables the collection of data from diverse groups of respondents simultaneously. It offers a snapshot of a specific population or phenomenon at a given point in time, facilitating an understanding of how the dependent variable relates to various independent variables.

According to Smith and Johnson (2018), cross-sectional research designs are particularly advantageous for exploring relationships between variables in a cost-effective and time-efficient manner. By collecting data from multiple groups or individuals in a single instance, researchers can gain a comprehensive perspective on the subject of interest. This simultaneous data collection process not only enhances the breadth of the study but also ensures a high degree of precision, reliability, and validity in the data gathered.

The concept of precision, as defined by Roberts and Brown (2017), refers to the degree of accuracy and consistency in the measurement of variables. Cross-sectional studies often incorporate meticulous data collection techniques and rigorous methodologies to minimise errors and discrepancies, ultimately resulting in highly precise findings. Reliability, in the context of research, is the ability to consistently obtain similar results under similar conditions. A cross-sectional design, as proposed by Thompson (2019), aids in achieving this reliability by minimising variations that may arise when data is collected at different times or through different means.

Furthermore, the validity of the data collected in a cross-sectional study is a crucial aspect of research quality. According to Gray and White (2021), the methodological rigour and design of cross-sectional studies are well-suited to establish the validity of findings. By collecting data from diverse groups simultaneously, any potential biases or inaccuracies in the research process can be identified and addressed promptly, leading to more reliable and valid outcomes.

## **3.2 Geographical Coverage**

The study was conducted within the southern province of Rwanda, specifically in the Huye District, focusing on the Rwasave marshland. The selection of Rwasave marshland as the study area was guided by a careful review of relevant literature, which shed light on its significance in the context of agricultural and socio economic challenges faced by the local community.

One of the primary factors that drew the researchers to Rwasave marshland was the well-documented issue of low-income generation stemming from rice farming, as highlighted by Kankindi (2019). This low-income generation has had far-reaching consequences, including limited access to financial resources from banking institutions by a substantial portion of the community, commonly referred to as KOAIRWA. The recognition of this economic disparity and its repercussions underscores the urgency and relevance of the study within the local context.

Additionally, the choice of Rwasave marshland as the study area aligns with the multifaceted goals of the TUBURA projects, which have been implemented to improve the livelihoods of agricultural cooperative farmers in the region. These initiatives, as elucidated in the works of various scholars (e.g., TUBURA, 2020), have been instrumental in addressing the challenges faced by local farmers. By selecting Rwasave marshland as the study area, the researchers aimed to gain firsthand insights into the impact of these cooperative-based projects on the well-being and economic stability of the farmers in the KOAIRWA community.

The selection of Rwasave marshland was further justified by its strategic advantages, including accessibility, cost-effectiveness, and the familiarity of the key area to the researchers. Access to the study area was facilitated by well-established transportation networks and logistical support, ensuring that data collection and engagement with local stakeholders could be carried out efficiently. This approach not only saved valuable time and resources but also fostered a more profound understanding of the local context and the specific needs of the community.

## **3.3 Population, Sample and Sampling Strategies**

### **3.3.1 Target Population**

The targeted population was a total of 864 rice farmers who work with KOAIRWA (Kankindi, 2019).

### 3.3.2 Sample size

Yamane formula was used to calculate the sample size that represents the total population. Yamane formula has a 95% confidence level and only 5% margin of error. Thus, the formula is:

$$n = \frac{N}{(1 + N(e)^2)}$$

n = stands for sample size,

N = for population size

and e for margin error.

$$n = \frac{864}{(1+864(0.05)^2)} = 273$$

The sample size comprised 273 respondents.

### 3.3.3 Sampling techniques

In this study, we implemented a simple random sampling technique (Thomas, 2023), a method of utmost importance in our research design. Simple random sampling is a meticulous process aimed at ensuring an unbiased and equitable representation of the TUBURA project's beneficiaries within the cooperative (Cooper and Schindler, 2014). By drawing from a carefully compiled list of beneficiaries, every member of the cooperative had an equal chance of being selected. A researcher obtained a list of all active members, and each member was assigned a number, and the numbers were written on a piece of paper. Then the pieces of paper were mixed in bucked and picked randomly. This method was used because it was difficult to meet all the respondents at a single point in time; therefore, the researcher selected the respondents to answer the stated research question randomly.

This approach not only upholds ethical principles by treating all members with impartiality but also fosters trust and cooperation among participants (Creswell, 2013). It contributes to the study's integrity and ensures the reliability of the collected data (Gall et al., 2015). Moreover, our goal is to obtain a dataset that accurately reflects the diversity and characteristics of the entire cooperative, ultimately enhancing the generalizability of our findings to the broader population of cooperative members in KOAIRWA, Rwanda.

### **3.4 Types and Sources of Data**

#### **3.4.1 Types of data**

A sequential explanatory mixed method design was applied, this is because the research first collected quantitative data on farmer's attitude, implications of farming input availability, accessibility and affordability and the farmer's livelihood before and after intervention of project. Then, the research collected qualitative data through interviews, to assess impact of agricultural cooperative based project on farmer's livelihood

Quantitative and qualitative data are two distinct yet complementary tools in the research arsenal (Creswell, 2013). Quantitative data is systematic and measurable, making it superb for numerical analysis but sometimes lacking depth and context. In contrast, qualitative data is rich in detail but can be challenging to generalise. The integration of both types of data empowers researchers to capture a more comprehensive view of the phenomenon under scrutiny.

The quantitative data collection hinged on closed-ended questions. This structured approach enabled the systematic gathering of numerical data, perfect for quantifying and analysing specific variables, patterns, and relationships. Quantitative data laid a robust foundation for statistical analysis, facilitating the exploration of trends, correlations, and the measurement of key parameters.

Conversely, we ventured into the realm of qualitative data through key informant interviews, a method celebrated for its depth and richness. These open-ended discussions offered invaluable insights and context for our research findings. Key informants, often experts or individuals with direct experience in the subject area, contributed qualitative perspectives that enriched our data with narratives, personal experiences, and perspectives that quantitative data alone would have overlooked. Qualitative data excelled in unearthing intricate details, decoding complex human behaviours, and probing the 'why' and 'how' behind the numerical trends (Michael, 2015).

Qualitative data typically finds its way into research through interviews, focus groups, and observation. Thematic analysis is the method of choice for dissecting this qualitative wealth, identifying patterns and extracting meanings from the data.

Qualitative data allowed us to tackle questions like "What challenges do farmers in KOAIRWA, Rwanda face and How has the TUBURA project shaped the lives of farmers in KOAIRWA, Rwanda

The decision to blend both data types was a strategic one, aimed at harnessing the robust analytical capabilities of quantitative data while enriching our findings with the depth and context provided by qualitative data. This methodological diversity enabled us to delve into a more holistic examination of the impact of the TUBURA project on the livelihoods of farmers in KOAIRWA, Rwanda.

### **3.4.2 Sources of data**

In this research, the researcher predominantly relied on primary sources of data. Primary data represents information that is collected directly from KOAIRWA members or entities who are directly linked to the subject under investigation (Robert, 2013). In this case, the primary data was gathered directly from the members of the KOAIRWA co-operative, individuals intimately involved with the TUBURA project in KOAIRWA, Rwanda.

This primary data was procured through two main methods: surveys and interviews. Surveys provided structured and quantifiable information by asking predefined questions to cooperative members. Interviews, on the other hand, offered a more open-ended approach, allowing us to delve into the nuanced experiences and perspectives of the beneficiaries.

The rationale behind utilising primary sources of data was to ensure the accuracy and authenticity of the information. By collecting data directly from the project beneficiaries, themselves, the researcher was able to bypass potential intermediaries or interpretation biases, thus obtaining firsthand insights into their experiences, challenges, and the true impact of the TUBURA project on their livelihoods. This direct engagement with primary sources of data is pivotal in enhancing the credibility and validity of our findings, as it offers an unfiltered and direct line to the voices and experiences of those most affected by the project.

The secondary data: Secondary data refer to data that have already been collected by others and which have been passed through statistical processes. Published and unpublished document will be used such as reports, journals, interest and new letters



### **3.4.3 Data collection techniques**

The data collection techniques included questionnaires and interviews. Two methods were used in order to have reliable data and supplement the weaknesses of one data collection tool compared to the other.

#### **3.4.3.1 Survey questionnaires**

The study used structured questionnaires to gather information which is intended to answer the questions of the research as shown Appendix I. Questionnaires were distributed to koairwa farmers. Self-administers of questionnaires were applied whereby the researcher had to visit the offices of the koairwa cooperative to establish the areas where the selected members would be obtained. The researcher visited the members of koairwa and served the questionnaires, which were filled out in his presence and collected on some days. Due to the presence of the researcher during the filling of the questionnaire, the response rate was high and respondents completed the questionnaires accurately and honestly. A questionnaire as a tool was preferred since it gave a participant time to think and respond, saved time, and also enhanced the anonymity of respondents. The questionnaire was translated in Kinyarwanda to facilitate better understanding to all respondents.

#### **3.4.3.2 Key informant's interview**

The study applied interview methods where by, KOAIRWA farmers' cooperative s and key and key informants were used different questions to answer see Appendix III, and their answers were noted down for further analysis. The key informants were the KOAIRWA chairperson, manager, secretary, and four accountants. These people were chosen to provide genuine information. Interviews were conducted in two different sessions: two were met in the first session, manager and chairperson, and the five were met in the second session, manager and four accountants at 50 minutes. A structured interview was used to guide the interview checklist as a tool with a set of pre-determined questions since it facilitated a very flexible and faster response, enabling the client to acquire proper information.

In the light of this they were nine themes in the interview session as shown in Appendix III and they were grouped into three broader categories; fist category was Impact of TUBURA Project (themes 1-4), second category was Accessibility and Affordability of Farming Inputs (themes 5-6) and the third one was Success of

TUBURA Project (themes 7-9). This grouping of themes suggest that the interview session was designed to explore a wide range of impact of TUBURA project on farmer's livelihood in KOAIRWA.

### 3.5 Data Reliability and Validity

The study demonstrated construct validity through the questions that are specifically constructed towards answering the hypotheses. The questions were also evaluated to prevent unnecessary or excessive questions being asked. Secondly, the study also demonstrated content validity through measuring all the aspects that are intended to be measured. Similarly, to content validity, the study further exhibited face validity through connecting the questions to the topic that is aimed to be studied. Lastly, the research demonstrated criterion validity by demonstrating the way research results correspond with what previous research has determined.

The reliability was measured using Cronbach Alpha coefficient to test for internal consistency of the questionnaire. A value above 0.7 is recommended by Creswell (2016), otherwise the instrument has to be modified. The pilot results indicated that the categories had a Cronbach Alpha of above 0.7 and thus was reliable.

**Table 1: Reliability outputs**

Categories	Cronbach Alpha	Items
Farmers Attitude	0.706	3
Farming input availability, accessibility, and affordability	0.770	9
Livelihood	0.88	10

### 3.6 Data Analysis

The quantitative data that was obtained through the questionnaire was analysed through the Statistical Package for Social Sciences (SPSS) software. This study used descriptive and inferential analysis. In descriptive analysis, percentages, means, and standard deviation were used, while in inferential analysis, multiple linear regression was used for the second objective, and two and a T test were used for the third objective.

In order to analyse objective one, which was to assess KOAIRWA farmers' attitude toward the TUBURA project for their livelihood, descriptive analysis and interviews were used. Descriptive analysis based on results that were obtained through questionnaires and interviews was used in order to assess KOAIRWA farmers'

attitudes toward the TUBURA project. The interview was held with representatives of KOAIRWA Co-operative and other selected farmers based on their availability and the feasibility of the answers that they could provide.

To investigate the relationship between the availability, accessibility, and affordability of farming inputs and their impact on the livelihood of KOAIRWA farmers, which was our second objective, we employed a multiple linear regression model. This model allows us to assess the connection between a dependent variable (Farmers' livelihood) and a set of independent variables, specifically the availability, accessibility, and affordability of seeds, fertilisers, pesticides, and farming tools.

I selected this model primarily because the dependent variable was transformed using a mean. This transformation was necessary to ensure that the dependent variable remained continuous. In fact, the livelihood variable was constructed from five different indicators: shelter access, healthcare access, education access, food security, and clothing access. To obtain a representative data point for livelihood, we used the mean transformation, which combined the data from these five indicators.

Below is the equation for the multiple linear regression.

$$\gamma = \beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \varepsilon_0$$

Where;

$\gamma$  =Livelihood;  $\beta_0$ : Regression Constant;  $\chi_1$ =farming input availability,  $\chi_2$ = farming input accessibility;  $\chi_3$ = farming input affordability;  $\beta_1$  =Coefficient of  $\chi_1$ ;  $\beta_2$  =Coefficient of  $\chi_2$ ;  $\beta_3$ =Coefficient of  $\chi_3$ ;  $\varepsilon_0$ =The Error Term.

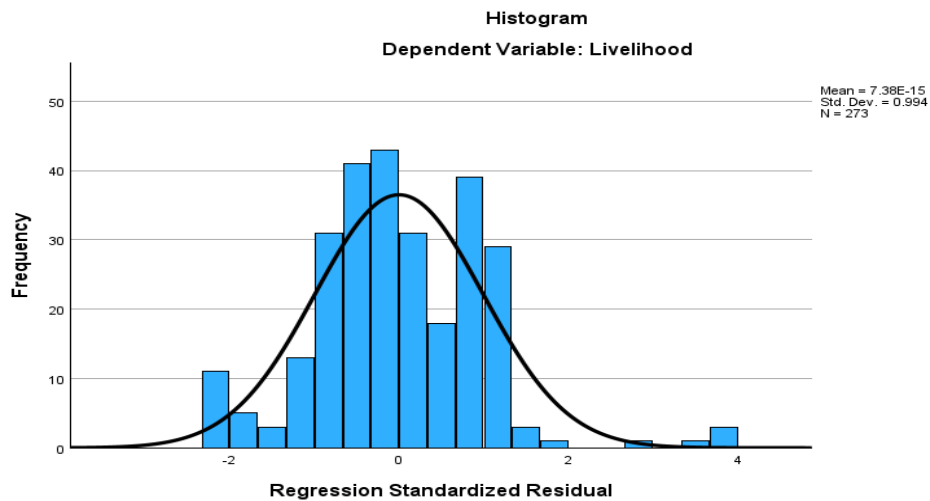
To assess KOAIRWA farmers' livelihoods before and after the intervention of the TUBURA project, the third objective paired sample T test was applied. In order to run the T test, the researcher collected data related to the livelihood of KOAIRWA farmers before and after the TUBURA project implementation.

#### **4.6.1 Diagnostic tests**

##### **4.6.1.1 Linearity and Normality of Data**

The normality assumption of multiple linear regression was checked using probability plot or histogram of residuals. The literature attested that graphical methods are significant tools for identifying deviation from the assumption of normal distribution

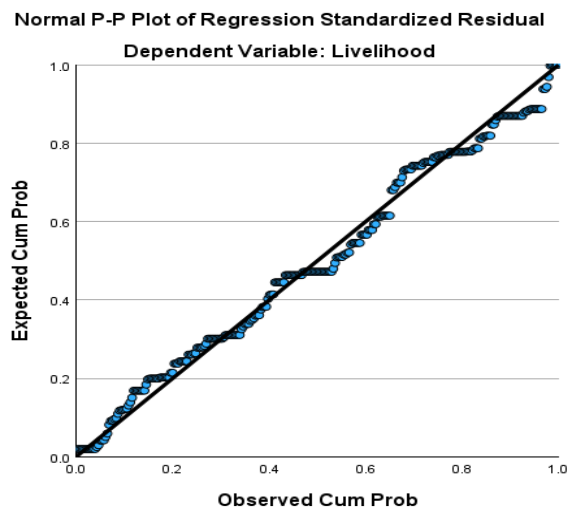
(Chambers *et al.* 1983). Beleke (2020) states that the histogram which displays a bell-shaped curve shows that the data follow a normal distribution. As illustrated in figure 2, the results show a bell-shaped curve which shows that the residual plot appears to follow a normal distribution.



**Figure 2: Histogram of normality of Data**

#### 4.6.1.2 Linearity of Data

The linearity assumptions are checked by the p-p plot of standardised residuals. Thus, normal P-P plot of regression standardised residuals show that normal probability plot for the residual is appropriately straight line. The figure 3 indicates that the regression model is approximately on the straight line and it indicates the dependent variable (Livelihood) and independent variables represent a linear relationship.



**Figure 3: Normal p-p plot of Regression Standardised Residual**

#### 4.6.1.2 Multicollinearity test

Naara (2020) argues that multicollinearity occurs in a Multiple Linear Regression analysis when there are robust correlations not only among the independent variables and the independent variable but also among the independent variables themselves. This phenomenon can result in some variables in the study losing their statistical significance.

In the context of this investigation, we evaluate the presence of multicollinearity through two primary indicators: Tolerance and the Variance Inflation Factor (VIF). The VIF in a Linear Regression model quantifies the extent to which the accuracy of regression estimates is affected by multicollinearity (Mark *et al.*, 2020). Typically, Afundate and Alan (2023) highlight that multicollinearity is identified when the Tolerance value falls below 0.20 and the VIF value exceeds 5 within the regression model.

In this particular analysis, the Tolerance values fall within the range of 0.208 to 0.754 (Tolerance >0.20), While the VIF values range from 1.326 To 4.815 (VIF<5). Therefore, based on these statistics, it is reasonable to conclude that multicollinearity is not a significant issue within the regression model.

**Table 2: Multicollinearity test**

Variables	Tolerance	VIF
Farming input availability	0.212	4.723
Farming input accessibility	0.208	4.815
Farming input affordability	0.754	1.326

**Table 3: measurement levels**

Variables	Definition	Measurement	Instrument
Farmers attitude	Satisfaction, Training provision And Field support	Five-point Likert Scale	Questionnaire and interview
.Farming input availability ,accessibility and affordability	Seeds ,pesticides and fertilisers	Five-point Likert Scale	Questionnaire and interview
Livelihood	Shelter access ,healthcare access, education access food security and clothes access	Five-point Likert Scale	Questionnaire and interview

## CHAPTER FOUR

### 4.0. FINDINGS AND DISCUSSIONS

This chapter presents the study findings, analyses, and accompanying discussions. It is basically divided into three sections, which entail the demographic description of the unit of observation, the findings of the study, and the statistical model results.

#### 4.1 Response Rate

The response rate was analysed to show the representativeness of the sample size. A response rate is very important to the credibility of the research results. A low response rate may decrease the statistical power of the data collected and undermine the reliability of the results. It may also undermine the ability of the researcher to generalise the results to the larger target audience. The study administered 273 questionnaires to the respondents and the results were as shown in Table 2.

**Table 4: Response Rate**

Category	Total
Number of respondents	273
Returned	273
Unreturned	0
Response Rate	100%

Results in Table 2 show that 273 respondents were administered the questionnaire. A total of 273 respondents successfully filled out and returned their questionnaires, translating to a 100% response rate. Babbie (2004) also asserted that return rates above 50% are acceptable to analyse and publish, 60% is good, and 70% is very good. Thus, 100% was considered very good for the study. The return rate was attributed to constant follow up on the respondents which was conducted on a daily basis.

#### 4.2 Demographic Characteristics of Respondents

##### 4.2.1 Distribution of respondents by sex

The gender respondents of KOIRWA farmers participating in the TUBURA project indicated that 64.1% are female and 35.9% are male. This demonstrates that women participate more in the KOIRWA co-operative than men. This can be justified by the fact that women participate more in agricultural activities than men.

##### 4.2.2 Education levels

A majority of participants, around 74.3%, have a low education level (primary school and secondary school). This includes individuals with no formal education (15.1%),

those with primary education (59.2%), and others with vocational or secondary education. The presence of beneficiaries with lower educational backgrounds indicates the project's inclusivity, targeting a diverse range of individuals. By involving individuals with varied educational levels, the TUBURA Project potentially provides training, knowledge, and skills that could uplift the capabilities of participants and enhance their agricultural practices. This education-focused approach aligns with the goal of improving farming techniques and yield outcomes.

#### **4.2.3 Marital status**

The marital status distribution among participants reflects the project's reach across different marital categories. A significant proportion, 82.8%, of beneficiaries are married, indicating that the project is benefiting families and households. Additionally, 13.9% are widows, highlighting the project's potential role in supporting vulnerable individuals who might have lost their primary sources of income. Even single individuals (1.1%) and divorced participants (2.2%) are represented, showcasing the project's capacity to engage diverse segments of the community. This diverse engagement underscores the project's potential to impact households, including those led by women, who often face higher levels of vulnerability due to their marital status.

#### **4.2.4 Age**

The age distribution of Koairwa farmers indicates a heterogeneous demographic make-up. Notably, the most common age groups among farmers are those between the ages of 42 and 45 and 51 and 55, which account for 17.2% and 22.7% of the total. The second-largest age group is clearly the 51–55 age range, which is highly represented in the farming community. The distribution is well equal in the other age categories, with notable contributions from individuals in the 30-37, 46-50, and 62-68 age groups at 8.1%, 8.4%, and 12.8%, respectively. With just 0.7% and 1.5% of the population, respectively, the youngest (below 29) and oldest (81 and above) age categories are the lowest. The age range of Koairwa farmers is highlighted by this detailed demographic data, which offers insightful information for focused agricultural planning and assistance programs.

#### **4.2.4 Livestock ownership**

Out of the total respondents who participated in the TUBURA Project, a substantial portion, comprising 54.2%, reported being involved in livestock-related activities. This

indicates that a majority of the farmers in Koairwa are engaged in some form of livestock farming. On the other hand, 45.8% of the respondents indicated that they were not involved in livestock-related activities. This distribution of responses provides initial insights into the prevalence of livestock-related engagement within the community. The relatively high percentage of farmers participating in livestock activities suggests that animal husbandry holds importance in the local agricultural practices and livelihood strategies. This could be attributed to several factors, including the region's climate suitability for livestock rearing, traditional agricultural practices, and economic considerations.

**Table 5 : Demographic information of respondents**

<b>Items</b>	<b>Frequency</b>	<b>Percent</b>
<b>Gender</b>		
Male	98	35.9%
Female	175	64.1
<b>Education level</b>		
Illiterate	41	15.1 %
Primary	161	59.2 %
Ordinary Level	17	6.3 %
TVET	35	12.9 %
Secondary	11	4.0 %
University	8	2.6 %
<b>Marital Status</b>		
Married	226	82.8 %
Widow	38	13.9 %
Single	3	1.1 %
Divorced	6	2.2%
<b>Age</b>		
Below-29	2	0.7%
30-32	22	8.1%
33-37	23	8.4%
42-45	47	17.2%
46-50	32	11.7%
51-55	52	22.7%
56-58	31	11.4%
62-68	35	12.8%
70-74	29	10.6%
<b>Any Livestock</b>		
No	125	45.8%
Yes	148	54.2%

#### **4.4 Farmers' Attitude towards TUBURA Project for their Livelihood**

The first objective was to assess KOAIRWA farmers' attitude towards the TUBURA project for their livelihood. To measure the attitude of participants toward the TUBURA project, the researcher asked the respondents to agree or disagree with several statements in relation to satisfaction toward the project, training provided by the project, trust and the field support. The results obtained were analysed using



descriptive analysis such as mean scores and standard deviation. Those means were interpreted relying on the mean index developed by Kalatya and Moronge (2017). These researchers stated that the means of 1.0 to 2.5 show not agree, a mean of 2.6 to 3.4 show neutrality and the mean of 3.5 to 5.0 indicate agree.

To get the perception of the respondents about how satisfied they are with the project TUBURA, the researcher asked participants to agree or disagree with the statement: "I am satisfied with the overall performance of the TUBURA project" on a five Likert scale. The results displayed in table4 show that on the average, the respondents are satisfied with the overall performance of the TUBURA project (Mean=4.02, Std. Dev.=1.239). In detail, 48.0% of the respondents expressed strong agreement, 27.8% showed agreement, 10.6% maintained a neutral stance, while 8.1% strongly disagreed, and 5.5% disagreed with the statement. The notable concentration in the "strongly agree" and "agree" categories, totaling 75.8%, reinforces the notion that beneficiaries of the TUBURA project were indeed satisfied with its outcomes.

The focus group discussion revealed that

*The TUBURA project has helped us adopt improved and more sustainable farming practices. Our production increased, our income increased, and so did our livelihood (Discussants, FDG, Koarirwa, July 17, 2023).*

This statement highlights more the contribution of the TUBURA project to improving the farmer's livelihood of farmers who partook into the project. Their livelihood changed as the project was implemented.

Moreover, the researcher looked upon the attitude of participants towards the training that the project provided. To obtain their opinion, the researcher asked participants to agree or disagree with the statement: "The training offered by the TUBURA project was relevant to my needs" on a five-point Likert scale. The results in table4 indicate that the respondents on the average disagreed with the statement (Mean 2.78, Std. Dev.=1.606). The mean of 2.78 indicates that the project didn't provide enough training to its members. In particular, 34.1% of the respondents strongly disagreed, 23.1% agreed, 16.8% disagreed, 16.5% agreed, and 9.5% remained neutral in response to the statement. The greater concentration in the "strongly disagree" and "disagree" categories, making up 50.9%, underscores that the attitude of TUBURA project

beneficiaries towards the training provided by the project team leaned towards a neutral stance.

An interviewee said:

*“...The TUBURA project provided training to the representatives of groups; unfortunately, the representatives would not share adequately the training received with other members” (KII, KOAIRWA 18 July 2023)*

This statement attests that besides several benefits that the project provided to its participants, still the members of TUBURA project were left with low skills related to modern farming practices. In one way or another, this ensures that there is a certain level of livelihood that was expected by the participants of the TUBURA project but they weren't able to reach it.

In addition, the researcher also looked upon the attitude of participants toward the field support that the TUBURA project provided. To obtain their opinion, the researcher asked participants to agree or disagree with the statement: “I received adequate field support from the TUBURA project” on a five-point Likert scale. The results in table 6 indicate that the participants on the average agreed with the statement (Mean=3.65, Std. Dev.=1.463). To elaborate, 41.4% of the respondents strongly agreed, 21.2% agreed, 14.7% strongly disagreed, 12.8% remained neutral, and 9.9% disagreed with the statement. The predominant presence in the "strongly agree" and "agree" categories, totaling 62.6%, bolsters the perspective that beneficiaries of the TUBURA project may have faced challenges in accessing sufficient field support during the project. An interviewee stated:

*“...The field support that the TUBURA project has provided was a valuable assistance that has contributed to my success' ' (KII, KORWA, 18, July 2023).*

This statement proves that the project has enabled participants with field support which contributed to the success of their farming activities.

**Table 6: Descriptive analysis of farmer's attitude towards TUBURA projects for their livelihood**

Statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev
I am satisfied with the overall performance of TUBURA project	8.1	5.5	10.6	27.8	48.0	4.02	1.239
The training offered by TUBURA project was relevant to my needs	34.1	16.8	9.5	16.5	23.1	2.78	1.606
I received adequate field support from TUBURA project	14.7	9.9	12.8	21.2	41.4	3.65	1.463

The findings presented in the descriptive analysis demonstrate a significant and positive relationship between farmers' attitudes towards the TUBURA project and their livelihoods. This aligns with a broader body of literature exploring farmers' attitudes and perceptions towards various agricultural interventions and projects. Nyairo (2020) delved into the attitudes of smallholder farmers towards agricultural technologies, revealing a diverse range of opinions. Some farmers expressed high praise for the benefits of new farming inputs, while others harboured doubts about their effectiveness. This suggests that variations in farmers' attitudes are common, influenced by factors such as perceptions of the testing of new inputs and concerns about their impact.

Farouque et al. (2018) examined farmers' attitudes towards the OHOF approach in Bangladesh, indicating that a significant portion of the participants had favourable attitudes towards the approach. This study underscores the importance of measuring attitudes using a Likert Scale, which is consistent with the methodology employed in the current research. The positive attitudes found in Farouque et al.'s study suggest that farmers' receptiveness to innovative approaches can influence their success. Furthermore, the study by Smith, Tumuhaise, Baributsa, Birachi, and Lopez-Pereira (2018) in Rwanda reinforces the connection between farmers' cooperative participation, positive attitudes, and improved livelihood outcomes. The relationship between attitudes, engagement, and adoption of recommended practices in the cooperative context resonates with the current study's findings regarding the TUBURA project. The importance of assessing farmers' attitudes in cooperative-based projects is highlighted as a key factor in achieving positive outcomes.

Jones and Brown's (2020) exploration of the TUBURA Project in Ghana is particularly relevant, as it emphasises the need for understanding farmers' attitudes to ensure successful project implementation and positive livelihood changes. This echoes the core finding of the current research – that favourable attitudes towards the TUBURA project are associated with improved farmers' livelihoods. The insight provided by Jones and Brown emphasises that interventions must consider local perspectives and align with farmers' needs for maximum impact.

#### **4.5 Descriptive Analysis of Farming Input Availability, Accessibility and Affordability on KOAIRWA Farmers' Livelihood.**

The second objective was to examine the implications of farming input availability, accessibility and affordability on KOAIRWA farmers' livelihood. Regarding this study farming input availability was measured by requesting participants in the TUBURA project to agree or disagree with the set of statements on the five-point Likert scale (1= strongly disagree to 5= strongly agree): "I was able to find seeds during TUBURA project, I was able to find pesticide during TUBURA project, I was able to find fertilisers during TUBURA project, I was able to find farming tools during TUBURA project".

Moreover, farming input accessibility was measured by asking KOIRWA farmers who participated in TUBURA project to agree or disagree with the set of statement on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree): "I could access seeds during the TUBURA project, I could access pesticides during the TUBURA project, I could access fertilisers during the TUBURA project, I could access farming tools during the TUBURA project", then the input affordability was measured by asking KOIRWA farmers who participated in TUBURA project to agree or disagree with these set of statements on a Likert scale (1 = strongly disagree to 5 = strongly agree): "During the TUBURA project, the price of seeds was affordable; during the TUBURA project, the price of pesticide was affordable, during TUBURA project the price of fertilisers was affordable; during the TUBURA project the price was of farming tools was affordable."

In order to analyse objective 2 both descriptive and inferential analysis were used. In descriptive analysis means, standard deviation and percentage were used and in inferential analysis multiple linear were used.

#### 4.5.1 Descriptive analysis for Farming inputs availability

In this study in order to look upon the farming input availability, the researcher considered farming inputs such as seeds, pesticides, fertilisers, and farming tools. Regarding seeds availability, the findings displayed in table 5 below indicates that on average, participants agreed with the statement “I was able to find seeds during the TUBURA project” (Mean = 4.25, Std. Dev =1.242). The mean of 4.25 indicates that on average, respondents agreed that seeds were available during the project TUBURA. In particular, 67.4% of the respondents strongly agreed, 11.4% were neutral, 9.2% agreed, 6.6% strongly disagreed, and 5.5% disagreed with the statement. The predominant presence in the "strongly agree" and "agree" categories, totaling 76.6%, reinforces the notion that, during the TUBURA projects, farmers had a reliable source for acquiring seeds. During the group discussion, KOIRWA farmers who participated in the TUBURA project stated that:

*During the TUBURA project, seeds were available all the time.  
Either it is the farming season or not, we could still find seed.  
We are thankful to the project as it provided selected seeds  
(Discussants, FDG, Koairawa, 17, July 2023).*

This statement highlights the TUBURA project had a positive impact on the population who partook in it.

Moreover, regarding the pesticide availability, the results displayed in table 5 below indicate that on average, participants disagreed with the statement “I was able to find pesticide during the TUBURA project” (Mean=1.68, Std. Dev=1.077). The mean of 1.68 indicates that on average, respondents disagreed that pesticides were not available during the project TUBURA. In detail, 63.0% of the respondents strongly disagreed, 17.2% disagreed, 12.8% were neutral, 4.4% strongly agreed, and 2.6% agreed with the statement. The pronounced predominance in the "strongly disagree" and "disagree" categories, totaling 80.2%, underscores the perspective that beneficiaries of the TUBURA project encountered challenges in sourcing pesticides during the TUBURA projects. During the focus group discussion, participants argued that:-

*During the TUBURA project, one of the challenges that we faced was a lack of pesticides (Discussants, FDG, KOAIRWA, July 17, 2023).*

This statement was also strengthened by a key informant interviewee who stated:

*“...during the project TUBURA, pesticides were often provided to the head of groups...” (KII, KOIRWA, 18, July 2023).*

These two statements together confirm the findings found above. One of challenges met by participants in the TUBURA project was the unavailability of pesticide which most of time would lead to failing to fight against diseases of crops and lead to the low production or spend a lot of money looking for pesticides which would lead definitively to the low income because of high cost of production.

Furthermore, regarding the availability of fertilisers, the results shown in table 5 indicate that on the average, participants agreed with the statement “, I was able to find fertilisers during the TUBURA project” (Mean=4.12, Std. Dev=1.357). The mean of 4.12 indicates that on average, respondents agreed that fertilisers were available during the project TUBURA. To elaborate, 61.2% of the respondents strongly agreed, 16.1% agreed, 11.0% strongly disagreed, 7.3% were neutral, and 4.4% disagreed with the statement. The notable prevalence in the "strongly agree" and "agree" categories, comprising 77.3%, reinforces the viewpoint that beneficiaries of the TUBURA project encountered difficulties in locating fertilisers during the TUBURA project. During the focus group discussion, participants argued that:

*Thanks to the TUBURA project, fertilisers were very cheap as the government had provided them as subsidies (Discussants, FDG, KOAIRWA, 17, July 2023).*

According to responses of respondents, it is obvious the TUBURA project has played a major role in improving the production of KOIRWA farmers who participated in the project by providing fertilisers which impacted a lot on the increment of farmer’s income and consequently KOIRWA farmers ‘livelihood.

**Table 7: Descriptive analysis of farming input availability**

Statements	SD %	D %	N %	A %	SA %	Mean	Std. Dev
I was able to find seeds easily during TUBURA project	6.6	5.5	11.4	9.2	67.4	4.25	1.242
I was able to find pesticide easily during TUBURA project	63.0	17.2	12.8	2.6	4.4	1.68	1.077
I was able to find fertilisers easily during TUBURA project	11.0	4.4	7.3	16.1	61.2	4.12	1.357

#### 4.5.2 Descriptive statistics for farming inputs accessibility

In this study in order to look upon the farming input accessibility, the researcher considered farming inputs such as seeds, pesticides, fertilisers, and farming tools. Regarding the accessibility of seeds, the results shown in table 8 below indicate that on average, participants agreed with the statement “, I could access seeds during the TUBURA project” (Mean=4.17, Std. Dev=1.302). The mean of 4.17 indicates that on average, respondents agreed that seeds were available during the project TUBURA. To specify, 65.9% of the respondents strongly agreed, 10.3% remained neutral, 8.8% disagreed, 8.4% agreed, and 6.6% strongly disagreed with the statement. The significant predominance in the "strongly agree" and "agree" categories, totaling 74.3%, fortifies the perspective that beneficiaries of the TUBURA project had successful access to seeds during the TUBURA project. During the focus group discussion, participants argued that

*The advent of TUBURA project changed a lot in our farming expertise, we used to use traditional seeds but this project brought advanced seeds on a price that would allow each participant even the one of lowest income to access them (Discussants, FDG, KOAIRWA, 17, July 2023).*

KOIRWA farmers benefited from the TUBURA project the access to seeds. This revolutionised their farming practices. During the TUBURA project, farmers were not worried about where they will find seeds as they were ascertained that the project will provide seeds to them, therefore, this circumstance increased their motivation to engage in agricultural activities as they should see a good outcome from their effort.

In addition, regarding the pesticide accessibility, the results displayed in table 5 below indicate that on the average, participants disagreed with the statement “I could access pesticide during the TUBURA project” ( Mean = 1.74, Std. Dev =1.098). The mean of 1.74 indicates that on average, respondents disagreed that pesticides were not accessible during the project TUBURA. In particular, 60.1% of the respondents strongly disagreed, 17.2% disagreed, 15.4% remained neutral, 4.4% strongly agreed, and 2.9% agreed with the statement. The marked emphasis on the "strongly disagree" and "disagree" categories, making up 77.3%, reinforces the belief that beneficiaries of the TUBURA project encountered challenges in accessing pesticides during the TUBURA projects. This was due to the project not providing clear guidance on where

farmers could obtain pesticides, leaving them to fend for themselves in search of these crucial resources. During the focus group discussion, participants said;

*We used to walk a long way looking for pesticides; there was no place where we could find pesticides nearby unless we went downtown. Walking long distances to search for pesticides exposes them to a lot of risks. Besides the loss of time, many should not see the importance of pesticides as they are not accessible in the neighbourhood and then decide not to use them, which would lead to low production. (Discussants, FDG, KOAIRWA, 17, July 2023).*

Moreover, regarding the accessibility of fertilisers, the results shown in table 6 below indicates that on average, participants agreed with the statement “I could access fertilisers during the TUBURA project” (Mean=4.09, Std. Dev=1.339). The mean of 4.09 indicates that on average, respondents agreed that fertilisers were accessible during the project TUBURA. To elaborate, 63.7% of the respondents strongly agreed, 11.4% remained neutral, 10.6% strongly disagreed, 9.9% agreed, and 4.4% disagreed with the statement. The notable predominance in the "strongly agree" and "agree" categories, totaling 75.1%, reinforces the belief that beneficiaries of the TUBURA project were able to access fertilisers during the TUBURA project.

**Table 8: Descriptive analysis of farming input accessibility**

<b>Statements</b>	<b>SD %</b>	<b>D %</b>	<b>N %</b>	<b>A %</b>	<b>SA %</b>	<b>Mean</b>	<b>Std. Dev</b>
I could access seeds during TUBURA project	6.6	8.8	10.3	8.4	65.9	4.17	1.302
I could access pesticide during TUBURA project	60.1	17.2	15.4	2.9	4.4	1.74	1.098
I could access fertilisers during TUBURA project	10.6	4.4	11.4	9.9	63.7	4.09	1.339

#### **4.5.3 Descriptive statistics for farming inputs affordability**

In this study, the researcher considers the affordability of farming inputs' prices in order to measure the affordability of farming inputs such as seeds, pesticides, and fertilisers. Therefore, in order to measure the affordability of farming inputs (seeds, pesticides, and fertilisers) the researcher asked respondents to agree or disagree with a set of statements on a five-point Likert scale (1=strongly disagree, 5=strongly agree). The statements were: “I could afford the price of seeds during the TUBURA project, I



would afford the price of pesticides during the TUBURA project, I was able to afford the price of fertilisers during the TUBURA project”.

In general participants were neutral about the affordability of farming inputs. The mean of seeds affordability is 3.18 with its associated standard deviation of 1.597; the mean of fertilisers affordability is 3.03 with its associated mean of 1.735. According to Kalatya and Moronge (2017), those mean scores fall into the range of 2.5 and 3.4 which means that they were neutral about the statement. These means indicate that respondents in general were neutral about the affordability of farming inputs except for the pesticides where they confirmed that the price was not affordable (Mean=1.65, Std. Dev=1.089).

During the focus group discussion when respondents were asked to provide their point of views, they stated that

*The price of farming input is fixed at a low price that everyone can afford. The problem is that the price is not stable; sometimes the price can be higher or lower than the expected price. Thus, as the majority of us live thanks to farming products only, when the price increases by even F200, it becomes unaffordable for many of us (Discussants, FDG, KOAIRWA, 19 July 2023).*

People living in agriculture only most of the time don't have enough savings which causes the lack of finding another funding source in case of shortage of means prepared for seeds, pesticides, and fertilisers. Thus, though in general KOIRWA farmers gained a lot through the TUBURA project, some challenges were faced.

**Table 9: Descriptive analysis of farming input affordability**

Statements	Mean	Std. Dev
I could afford the price of seeds during TUBURA project	3.18	1.597
I would afford the price of pesticides during TUBURA project	1.65	1.089
I was able to afford the price of fertilisers during TUBURA project	3.03	1.735

#### **4.6 Inferential analysis of farming input availability, accessibility and affordability on KOAIRWA farmers' livelihood.**

This study employed the Multiple Linear Regression (MLR) model in order to predict a dependent variable (Y) using two or more predictors' variables (X) (Mark *et al.* 2020). Moreover, Multiple Linear Regression (MLR) allowed the researcher to make

conclusions about the entire population based on data collected from a representative sample. Thus, the researcher used Multiple Linear Regression to assess the relationship between KOIRWA farmer's livelihood and farming input availability, accessibility, and affordability.

As the dependent variable (farmers' livelihood) has many indicators and multiple linear regression accepts only one indicator, the researcher transformed the dependent variable using mean scores in order to get one which is representative of all. Moreover, same as the dependent variable, for the independent variables the mean transformation was also used. However, before running multiple Linear Regression assumptions were first checked.

#### **4.6.2 Pearson correlation**

To investigate the correlation between variables, a correlation analysis was carried out. The results presented in figure ... reveal that the data follows a normal distribution, which prompted the use of a bivariate Pearson correlation test. This statistical test acts as an indicator of the statistical relationship between two continuous variables.

The table 9 shows the results of the Pearson correlation coefficient analysis. The result indicates that there is a positive and strong association between Farming input availability and livelihood ( $r=0.59$ ,  $p<0.001$ ). This indicates that the availability of seeds, pesticides and fertilisers play a major role in improving the livelihood of farmers in KOIRWA co-operative. Furthermore, it sheds light about the participation of TUBURA project in improving the livelihood of farmers especially by making farming input such as seeds, pesticide and fertilisers available for them.

Moreover, the results show that there is a strong and positive correlation between farming input accessibility and farmers' livelihood ( $r=0.591$ ,  $p<0.001$ ). This association highlights the importance of the TUBURA project in making seeds, fertilisers and pesticides accessible to KOIRWA farmers. Based on the Pearson correlation, it is obvious that the fact that farmers were able to access farming input increased their livelihood.

Finally, the correlation between farming input affordability and livelihood is weak but positive ( $r=0.320$   $p<0.001$ ). This result shows that the TUBURA project took part in reducing prices of seeds, pesticides, and fertilisers but still some challenges were still

presented. However, the positive Pearson correlation indicates that seeds, fertilisers, and pesticides price reduction (affordability) significantly impacted on the livelihood of KOIRWA farmers.

**Table 10: Correlation analysis of demographic factors**

Variables		Lh	IAv	IAC	IAf
Lh	Pearson Correlation	1			
	Sig.(2-tailed)				
	N	273			
IAv	Pearson Correlation	0.590**	1		
	Sig. (2-tailed)	<0.001			
	N	273	273		
IAC	Pearson Correlation	0.591**	0.887**	1	
	Sig. (2-tailed)	<0.001	<0.001		
	N	273	273	273	
IAf	Pearson Correlation	0.320**	0.473**	0.488*	1
	Sig. (2-tailed)	<0.001	<0.001	<0.001	
	N	273	273	273	273

\*\* Correlation is significant at the 0.01 level (2-tailed)

\* Correlation is significant at the 0.05 level (2-tailed)

**NB:** Lh=Livelihood, IAv= Input availability, IAC= Input Accessibility, IAf= Input Affordability

#### 4.6.3 Goodness-of-fit

The assessment of how well the multiple regression model aligns with the data points is termed as the model's goodness-of-fit. This evaluation is quantified by the square of the multiple correlation coefficient, known as  $R^2$ , as well as the adjusted  $R^2$ . The coefficient of determination,  $R^2$ , serves as a statistical metric indicating how closely the regression line matches the data, while the adjusted  $R^2$  is typically preferred as a gauge of the regression model's quality.

The  $R^2$ , presented in table10 suggests that only 0.37% of the total variation in farmers' livelihood can be explained by factors such as farming input availability, accessibility, and affordability. Meanwhile, the adjusted  $R^2$  in this study indicates that 0.363 of the overall variation in farmers' livelihood can be accounted for by the predictor variables utilised in the model, Since the value of  $R^2$  and adjusted  $R^2$  are quite similar, it suggests that at least one of the predictor variables contributes valuable information for predicting the response variable, i.e., farmers' livelihood. In short, both values demonstrate that the model is a good fit for the data.

Furthermore, the overall capability of the regression model to predict the response variable was assessed using an F-test, or equivalently, through an analysis of variance (ANOVA) statistic [ $F(3, 269) = 52.679$ ], with a significance level of  $p < 0.001$ . This implies that the regression model estimated here is statistically significant at the alpha level of 0.05

**Table 11: Model independent variable summary and analysis of variances of farmers' livelihood**

**Model Summary**

Model	R	R Square	Adjusted R square	Std. Error of Estimate	R square change	F change	df1	df2	Sig change
1	0.608	0.370	0.363	0.08162	0.370	52.679	3	269	<0.001

**ANOVA**

Model		Sum of Squares	Df	Mean of Square	F	Sig
1	Regression	1.053	3	0.351	52.679	<0.001
	Residual	1.792	269	0.007		
	Total	2.845				

**4.6.4 Parameters estimation**

**Table 12: Multiple linear regression analysis and parameter estimation farmer's livelihood and show its implication**

Parameters	Unstandardized Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.379	0.017		22.207	<0.001
Input availability	0.188	0.066	0.302	2.872	0.004
Input accessibility	0.207	0.071	0.311	2.930	0.004
Input affordability	0.013	0.028	0.025	0.449	0.754

a. Dependent variable: Livelihood

The table above displays the estimated parameters of multiple linear regression models, the constant is significant ( $B = 0.379$ ,  $p = < 0.05$ ), this indicates that though the predictors remain constant, KOIRWA farmers will still be able to make their living at 0.379.

Moreover, the findings show that farming input availability has a positive and significant impact on farmer's livelihood ( $B = 0.188$ ,  $p = 0.004$ ). This suggests that for every 1 unit increase in the availability of farming inputs such as seeds, pesticides, and fertilisers, farmers' livelihood is expected to increase by 0.188 units. These findings

highlight that the TUBURA project has increased farmer's livelihood by making seeds, pesticides, and fertilisers available for farmers.

Furthermore, the farming input accessibility such as seeds, pesticides, and fertilisers showed a positive and significant influence on farmer's livelihood ( $B = 0.207$ ,  $p = 0.004$ ). This shows that for every 1-unit increase in the accessibility of farming inputs, farmers' livelihood is expected to increase by 0.207 units. These findings shed light on the importance of accessing seeds, pesticides, and fertilisers by farmers in order to improve their livelihoods, TUBURA project played a crucial role by providing farming input to KOIRWA farmers. These results highlight that through the provision of seeds, pesticides, and fertilisers KOIRWA farmer's livelihood were increased. These results align with the findings of Abebe *et al.* (2017) who found out that accessing farming inputs of quality increases the productivity and the livelihood consequently.

Similarly, Rwirahira's (2009) situational analysis of the Rwandan agricultural sector highlighted challenges related to the use of modern technology, fertilisers, improved seeds, and pesticides. This lack of access to essential farming inputs was attributed to supply shortages, distribution network issues, lack of knowledge and skills, and affordability constraints. Your study's findings align with this assessment, as they underscore the positive impact of improved input availability, accessibility, and affordability on farmers' livelihoods.

Similarly, Kimaro *et al.* (2018) conducted research on livelihood capabilities and their implications for coffee farming inputs among small-scale farmers in Tanzania. They found that livelihood capabilities influenced the availability, accessibility, and affordability of farming inputs, mirroring the focus of your study on these critical factors. This alignment strengthens the argument that addressing farmers' capabilities and input access can enhance their overall well-being.

Nkurikiye's (2016) perspective study on rice cooperatives in Rwanda emphasised the need for supplying farming inputs like fertilisers, pesticides, and certified seeds through cooperatives. This is in line with your study's findings, which highlight the positive influence of accessible and affordable inputs on farmers' livelihoods. The two

studies collectively underscore the importance of cooperative efforts in ensuring input availability and accessibility to improve agricultural productivity.

#### **4.7 KOAIRWA Farmers' Livelihood Before and After the Intervention of TUBURA Project**

The third aim of this research was to evaluate the livelihoods of KOAIRWA farmers both prior to and after the TUBURA project intervention. Before the TUBURA project, many members of the KOAIRWA cooperative were grappling with poverty due to a range of challenges. They encountered difficulties in obtaining high-quality seeds and fertilisers, lacked training in modern farming techniques, and possessed limited knowledge and skills related to farming activities. Moreover, acquiring farming inputs was a major obstacle, and the cost was an ongoing issue. This led to most farmers enduring impoverished living conditions, making it difficult for them to access fundamental necessities such as housing, healthcare, food security, and clothing.

However, following the implementation of the TUBURA project, KOAIRWA farmers began to experience a multitude of benefits. The project ushered in significant changes by making high-quality seeds, fertilisers, and pesticides available at affordable prices. This transformation enabled low-income farmers to afford these crucial inputs. Additionally, the project ensured that farming inputs were consistently accessible, resulting in increased income for the beneficiaries of the TUBURA project. Consequently, the TUBURA project played a pivotal role in addressing the social and economic challenges faced by KOAIRWA farmers. It not only secured their food supply but also improved their access to healthcare and enhanced their overall living conditions. This can be seen through comparing the means in the table below (more details about the impact of the project is shown in the following paragraph).

**Table 13: Description of means before and after the TUBURA project**

Indicators	Before TUBURA Project		After TUBURA project	
	Mean	Std. Dev.	Mean	Std. Dev
Food access	3.69	1.301	4.12	0.976
Shelter access	3.43	1.330	4.10	1.073
Clothes access	3.74	1.263	4.19	0.973
Health care access	3.85	1.250	4.23	0.968
Education access	3.77	1.205	4.10	0.997

To identify the impact of TUBURA project on farmers' livelihood, the researcher also used paired t test analysis in SPSS software. The paired sample t-test, is one of the widely used statistical tools to determine statistical difference between two measurements, two conditions, two time points etc. In this test, each subject is measured at two different times or for two related conditions or units which result in paired observations (Haewon & Min, 2018). The parameter used to make inference is the difference of the means of both data sets. The null hypothesis of the paired t-test ( $H_0$ ) assumes that the mean will be equal to zero ( $\mu_1 - \mu_2 = 0$ ), while the alternative hypothesis ( $H_1$ ) assumes that the mean will be either greater than zero ( $\mu_1 - \mu_2 > 0$ ), less than zero ( $\mu_1 - \mu_2 < 0$ ) or simply not equal to zero ( $\mu_1 - \mu_2 \neq 0$ ). Thus, if the p value is lesser than or equal to  $\alpha$ , the null hypothesis should be rejected. If the p-value is greater than  $\alpha$ ,  $H_0$  should not be rejected. The results were tested using the paired sample t-test presented in table 14 below

**Table 14: Results of the paired tests**

		Mean	SD	Std Error Mean	Lower	Upper	T	Df	One-side p	Two-sided p	Cohen's d
Pair1	Food after & before	0.429	1.267	0.077	0.278	0.580	5.588	272	<0.001	<0.001	1.267
Pair2	Shelter after & before	0.674	1.298	0.079	0.519	0.829	8.582	272	<0.001	<0.001	1.298
Pair3	Cloths after & before	0.443	1.159	0.070	0.305	0.581	6.319	272	<0.001	<0.001	1.159
Pair4	Health after & after	0.3895	1.112	0.067	0.252	0.517	5.712	272	<0.001	<0.001	1.112
Pair5	Edu after & before	0.333	1.030	0.062	0.211	0.456	5.346	272	<0.001	<0.001	1.030

In this study, the researcher collected data about the livelihood of KOAIRWA farmers before and after the intervention of the TUBURA project in order to determine the effect of the TUBURA project on their livelihood. The baseline was the livelihood before the intervention of TUBURA project Through a series of paired t-tests, the researcher examined the project's effects on food security, shelter access, clothing access, healthcare access, education access, and livestock ownership.

The results displayed in table 9 reveal a statistically significant increase in food security after the project implementation (Mean = 0.429, SD = 1.267),  $t(278) = 5.588$ ,  $p < 0.001$ , Cohen's  $d = 1.267$ . This substantial Cohen's  $d$  value indicates a large effect of size, suggesting that the TUBURA project had a significant and practically meaningful impact on improving food security within the study population, whereby

food security is essential for farmers to be able to work productively. If farmers are hungry or malnourished, they will not be able to do the physical labour required to farm their land. When farmers are food secure, they are more likely to be able to invest in their farms, take risks, and adopt new technologies. This can lead to increased productivity and income, which can further improve food security and livelihood capability.

Moreover, the TUBURA project demonstrated a significant and noteworthy impact on shelter access for KOIRWA farmers ( $M = 0.674$ ,  $SD = 1.298$ ,  $t(272) = 8.582$ ,  $p < 0.001$ , Cohen's  $d = 1.298$ ). This substantial positive effect is indicative of a considerable improvement in housing conditions for the beneficiaries, highlighting the project's success in enhancing the quality of shelter and living conditions. Whereas a secure and well-built home can help to protect farmers from shocks such as extreme weather events, pests, and diseases and when farmers have access to adequate shelter, they are more likely to be healthy and productive, and they are better able to cope with shocks and challenges. This can lead to improved livelihood outcomes for farmers and their families.

The project also brought about a substantial improvement in clothing access ( $M=0.443$ ,  $SD = 1.159$ ,  $t(272) = 6.319$ ,  $p < 0.001$ , Cohen's  $d = 1.159$ ). This effect underscores the positive impact on farmers' ability to acquire essential clothing items, which impact on farmers' ability to acquire essential clothing items, which can be pivotal in improving their overall well-being and dignity. When farmers have access to adequate clothing, they are more likely to be healthy and productive, and they are better able to cope with shocks and challenges. This can lead to improved livelihood outcomes for farmers and their families

The findings highlighted a statistically significant improvement in healthcare access ( $M = 0.385$ ,  $SD = 1.112$ ,  $t(272) = 5.712$ ,  $p < 0.001$ , Cohen's  $d = 1.112$ ). The results show that the TUBURA project has contributed to better healthcare access signifying an essential step toward enhancing the health and resilience of the farmers. Access to healthcare is essential for farmers to be healthy and productive. Farmers who are sick or injured are unable to work as effectively, which can lead to decreased productivity and income e. In addition, farmers who are sick or injured may incur significant medical expenses, which can further strain their financial resources



Education access also exhibited a positive response to the TUBURA project ( $M = 0.333$ ,  $SD = 1.030$ ,  $t(272) = 3.540$ ,  $p < 0.001$ , Cohen'  $d = 1.030$ ). The statistically significant change suggests that more farmers had opportunities for educating their kids and relatives. By helping farmers to pay school fees, agriculture cooperatives can help them to invest in their children's education and improve their livelihood capability in the long term. This can have a far-reaching implication for their livelihoods and the community's future prospects. During the focus group discussion, when the participants were asked how the TUBURA project increased their livelihood in general, they said that;

*Among the numerous advantages we gained from the TUBURA project, one of the most significant was the boost in our production capacity. This increase was made possible through the provision of essential resources such as seeds, fertilisers, and pesticides. As a result, our overall production saw a positive upswing, subsequently leading to higher income for each farmer. This increase in income allowed us to allocate resources more effectively, catering to the unique needs of each individual (Discussants, FDG, KOAIRWA, 19 July 2023).*

Thus, the TUBURA project achieved substantial and statistically significant improvements in various dimensions of KOIRWA farmers' livelihood. The results of this study align with the findings of Jones and Brown (2020) who found that the TUBURA Project had a positive impact on smallholder farmers' livelihoods in Ghana. The findings are consistent with the literature review of past findings, particularly Nabahungu and Visser's (2011) study on the contribution of wetlands to farmers' livelihoods. Nabahungu and Visser employed focus group discussions and surveys to analyse factors that contribute to the livelihoods of smallholder farmers living near wetlands. The study highlighted the importance of income sources like the sale of crop and livestock products, as well as non-agricultural activities such as craftwork, construction, and informal trade. The TUBURA project's positive impact on livelihoods resonates with this understanding of diverse income sources contributing to farmers' well-being.

Moreover, the significant positive mean differences in livelihood scores observed in the TUBURA project, along with their narrow 95% confidence intervals, underscore the reliability and practical importance of the findings. This aspect resonates with Kimaro's (2020) analysis of livelihood capabilities among small-scale coffee farmers. Kimaro's study categorised farmers based on their capability levels, considering indicators like access to food, quality of housing, medical services, and education. Similarly, the TUBURA project's focus on improving livelihoods aligns with the consideration of diverse indicators to assess changes in farmers' well-being. Furthermore, the comparison with the contribution of wetland agriculture to farmers' livelihoods, as outlined in Nabahungu and Visser's (2011) study, highlights the substantial impact of the TUBURA project. While the rice cultivation contributed an average of \$1045 per household per season in the Nabahungu and Visser study, the TUBURA project's positive mean differences in livelihood scores surpass this value. This underscores the effectiveness of the TUBURA project in enhancing farmers' livelihoods beyond traditional agricultural activities.

## CHAPTER FIVE

### 5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary

The farmer's livelihood is a global concern, both in developed and developing countries. The main purpose of this study was to investigate the assessment of an agricultural cooperative-based project. Specifically, the study sought to assess KOAIRWA farmers' attitudes towards the TUBURA project, examine the implication of farming input availability, accessibility, and affordability on KOAIRWA farmers' livelihoods, and assess KOAIRWA farmers' livelihoods before and after the intervention of the TUBURA project.

The research used a cross-sectional research design. It was carried out in the southern province of Rwanda, Huye district, Rwanda marchland. The sample size was 273 farmers. Moreover, the study used simple random sampling. In order to analyse the data, the study used, respectively, descriptive analysis, linear regression, and paired sample t-tests for the first, second, and third objectives. The descriptive analysis of demographic factors of respondents showed that females (64.1%) partake in farming cooperatives more than men; thus, women were more touched by the TUBURA project than men. Moreover, the study also revealed that the majority of farmers in the KOAIRWA coop have low education (74%). In addition, a significant number of beneficiaries of the project were married.

Regarding the first objective of this study, which was to assess KOAIRWA farmers' attitudes toward the TUBURA project for their livelihood, a descriptive analysis showed that a significant number of participants were satisfied with the intervention of the TUBURA project on one hand (mean = 4.02). On the other hand, the study revealed that members of the KOAIRWA cooperative didn't access the training provided by the project team as they were targeting representatives of groups (mean = 2.36).

Regarding the second objective, which was to identify the implications of farming input availability, accessibility, and affordability on KOAIRWA farmers' livelihoods, the results of multiple linear regression highlighted farming input availability such as seeds, pesticides, and fertilisers ( $B = 0.164$ ,  $p < 0.05$ ) and input accessibility ( $B = 0.202$ ,

$p < 0.05$ ) had a positive and significant impact on farmers' livelihoods, while input affordability was not statistically significant ( $B = -0.001$ ,  $p > 0.05$ ).

Regarding the third objective, which was to analyse the KOAIRWA farmers livelihoods before and after the intervention of the TUBURA project, The results of the paired sample t-test revealed that the TUBURA project increased the farmers' livelihoods in areas such as food security (mean = 0.429,  $p < 0.001$ ), shelter access (mean = 0.674,  $p < 0.001$ ), clothing access (mean = 0.443,  $p < 0.001$ ), healthcare access (mean = 0.385,  $p < 0.001$ ), education access (mean = 1.030,  $p < 0.001$ ), and ownership of livestock (mean = 0.275,  $p < 0.001$ ).

## **5.2. Conclusion**

Based on the findings and analysis conducted in this study, it is evident that the TUBURA project has had a substantial and positive impact on the livelihoods of KOAIRWA farmers in Rwanda.

First, in terms of farmer attitudes, a significant number of participants expressed satisfaction with the TUBURA project's intervention, indicating its effectiveness and relevance. However, a notable observation was that many members of the KOAIRWA co-operative did not have access to the training provided by the project, revealing a potential area for improvement in project outreach and inclusiveness.

Second, regarding the implications of farming inputs, the study demonstrated that the availability and accessibility of inputs such as seeds, pesticides, and fertilisers had a positive and significant impact on farmers' livelihoods. This emphasises the importance of ensuring adequate and accessible resources for farmers to enhance their agricultural productivity and overall well-being. While affordability did not show a significant impact, it remains an aspect that should not be overlooked in future interventions.

Third, the analysis of changes in livelihood before and after the TUBURA project's intervention revealed noteworthy improvements in various dimensions of farmers' lives. Food security, shelter access, clothing access, healthcare access, education access, and ownership of livestock all showed statistically significant positive changes. These findings underscore the holistic impact of the project on farmers' livelihoods, addressing multiple aspects that contribute to their well-being.

Therefore, the TUBURA project has made a substantial and positive contribution to the livelihoods of KOIRWA farmers in Rwanda. It has not only improved their agricultural productivity but has also enhanced their access to essential resources and services, resulting in improved living conditions. This study highlights the importance of cooperative-based agricultural projects in addressing the challenges faced by farmers in developing regions and emphasises the need for continued support and investment. As a case study, the TUBURA project serves as a valuable example of how targeted interventions can lead to meaningful improvements in the lives of smallholder farmers and their community.

### **5.3 Recommendations**

Building on the comprehensive analysis of the TUBURA project's impact on the livelihoods of KOAIRWA farmers, this section outlines a series of recommendations aimed at enhancing the project's effectiveness and ensuring sustainable improvements in farmers' well-being. The findings of this study have illuminated key areas of success, underscoring the project's positive contributions to various facets of the community's livelihoods. However, they have highlighted specific areas where targeted improvements and strategies are warranted. These recommendations encompass a range of aspects.

To maximise the project's impact, it is essential to improve outreach efforts and training programs. The observation that some KOIRWA cooperative members did not have access to project training highlights the need to ensure inclusivity and reach a wider audience. Strategies should be developed to engage all cooperative members, including those who may not actively participate in co-operative activities. The government and other stakeholders should find a way to provide training to co-operative members and non-members to motivate people to join co-operatives.

Moreover, though affordability of farming input did not show a significant impact in this study, it remains a vital consideration. Efforts should be made by the government and stakeholders to identify and address financial barriers that some farmers may face. Exploring mechanisms to make essential inputs more affordable, such as credit programs or co-operative financing initiatives can further improve farmer's access. In addition, co-operative members should develop a saving habit not only for accessing

seeds, pesticides, and fertilisers but also for any challenge which may erupt either in the farming sector or other sectors of life.

Establishing a robust monitoring and evaluation system is critical for assessing the project's ongoing impact on various aspects of farmers' livelihoods. Regular assessments will help identify areas that require improvement and allow for timely adjustments to project strategies, ensuring its effectiveness. Furthermore, the government and other stakeholders should encourage farmers to diversify their livelihood activities beyond agriculture, which is essential for economic stability. Supporting income-generating initiatives related to small businesses, value-added processing, or non-farm activities can further enhance their financial security.

To further consolidate the positive inclination of farmers towards the TUBURA project, it is recommended that project stakeholders continue engaging with the farmers to strengthen their understanding and awareness of the project's benefits. Regular communication, workshops, and community meetings can help address any concerns, provide clarifications, and foster a sense of ownership among the farmers. Additionally, the project team could consider tailoring training programs and support to meet the specific needs of different farmers, thus catering to a wider range of preferences and requirements. By continuously nurturing and reinforcing positive attitudes, the project can ensure sustained cooperation and commitment from the farming community, leading to more substantial long-term impacts.

Given the vital role of input availability, accessibility, and affordability in farmers' livelihoods, it is recommended that the TUBURA project collaborates with local agricultural agencies and suppliers to enhance the distribution channels for essential farming inputs. This could involve negotiating bulk purchase agreements, establishing input depots closer to farming communities, and exploring innovative financing options to make these resources more affordable. Moreover, continuous monitoring and evaluation of input distribution mechanisms can help identify and rectify any bottlenecks that hinder accessibility. By ensuring farmers have convenient access to quality inputs at reasonable prices, the project can contribute significantly to improved agricultural productivity and overall livelihoods.

To sustain and scale the positive impact of the TUBURA project on farmers' livelihoods, the study recommends that project managers and stakeholders prioritise ongoing monitoring and evaluation. Regular assessments can provide insights into the evolving needs of the farmers and help identify areas where additional support or adjustments might be necessary. Furthermore, the project should consider documenting and sharing success stories and case studies that highlight the tangible improvements brought about by the intervention. This can help garner continued support from funders, partners, and other stakeholders, while also motivating farmers to actively participate and benefit from the project. Scaling the project's impact could involve exploring opportunities to expand its reach to neighbouring communities or replicating its cooperative-based approach in other regions, thereby extending its benefits to a larger number of farmers.

### **5.3.1 Recommendations for the TUBURA Project**

It is highly suggested that the TUBURA Project implement a comprehensive follow-up procedure in order to evaluate the degree of satisfaction that its beneficiaries have with the services that are rendered, including the provision of necessary resources like seeds, fertilisers, and pesticides. Frequent feedback gathering will guarantee that the project stays in line with the changing demands of the Koairwa community in addition to offering insightful information for development. Comprehensive training programs are also desperately needed, and they must be provided by the TUBURA Project in addition to working with the Ministry of Agriculture. The training programs have to encompass a broad range of subjects in order to enhance the recipients' agricultural proficiency and promote a robust and flourishing farming community. Additionally, cooperation with the Rwanda Cooperative Agency (RCA) is to be investigated.

### **5.3.2 Recommendations for the Rwanda Cooperative Agency (RCA)**

It is recommended that the Rwanda Cooperative Agency expand its assistance to cooperatives by putting in place organised training courses designed specifically for cooperative leaders. By doing this, leaders will be better equipped to handle the difficulties associated with long-term cooperative management. Moreover, it is critical that cooperatives embrace and abide by the seven cooperative principles as promoted by the RCA. These tenets work as cornerstones, directing cooperatives toward moral behaviour and prosperous operations. Rwanda's socio economic development is

greatly aided by cooperatives, and the RCA's aggressive engagement is essential to the cooperatives' continuing expansion.

### **5.3.3 Recommendations for cooperative leaders and KOAIRWA Cooperative**

Visionary leadership, which encourages thoughtful decision-making, creativity, and cooperation, should be embraced by cooperative leaders. Collaborative initiatives can be strengthened via partnering with other projects, organisations, and cooperatives. Cooperatives must have access to information, ongoing education, and training in order to be flexible and sensitive to shifting conditions. The long-term effects of the TUBURA Project should concentrate on enhancing the value of collected food and equipping farmers with knowledge to optimise profits. Including livestock programs can improve the sustainability of agriculture. The initiative should concentrate on offering more resources and training, encouraging koairwa farmers to participate, and resolving issues brought up by unsatisfied participants in order to maintain the beneficial effects. Training programs may be specifically improved by attending to issues and utilising positive comments. Farmers' lives have improved thanks in large part to the TUBURA initiative, and they encourage

### **5.4 Areas for Further Study**

According to the study and the aforementioned recommendations, further research on cooperative-based agricultural initiatives should concentrate on the following areas: The evaluation of agricultural cooperative-based initiatives aimed at various farmer demographics, including young, women, and smallholder farmers, Environmental effects of agriculture cooperative-based initiatives and the programs' long-term sustainability



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## APPENDICES

### Appendix I: Questionnaire (For KOAIRWA co-operative members)

Dear Respondent, I am Jean Bernard Ishimwe, a postgraduate student at Moshi Co-operative University, Tanzania where I am pursuing a Masters of Arts in Co-operative and Community Development. I am conducting research entitled “The Impact of Agricultural Co-operative Based Project on Farmers Livelihood. A case of the TUBURA Project in Koirwa, Rwanda”. I hereby request your time to respond to my questions for the success of my research. I hereby assure you that the information you will provide was used only for the purpose of this research and will remain confidential. I therefore look forward to your support in this noble cause.

**Thank you very much for your assistance.**

### SECTION A: Social demographic characteristics of the respondents

1) Location

Country.....

Region.....

District.....

Sector.....

Cell.....

Village.....

2) Gender of respondent \_\_\_\_\_

- Male \_\_\_\_\_
- Female \_\_\_\_\_

2) Marital status \_\_\_\_\_

3) What is your age? \_\_\_\_\_

4) Which level of education do you have? \_\_\_\_\_

5) How many years have you been engaged in rice farming? \_\_\_\_\_

6) How many kilograms of the rice crop did you harvest last season? \_\_\_\_\_

7) What are your sources of finance for farming? \_\_\_\_\_

8) Do you raise any livestock? \_\_\_\_\_

9) If yes, how many of the following do you raise? \_\_\_\_\_

- Cows \_\_\_\_\_
- Sheep \_\_\_\_\_
- Goats \_\_\_\_\_

- Chicken \_\_\_\_\_
- Donkey \_\_\_\_\_
- Ducks \_\_\_\_\_

10) What is the distance to the nearest TUBURA agent's shop? \_\_\_\_\_

11) What other physical inputs do you apply to the farm? \_\_\_\_\_

Please rank your attitude to the following statements. Circle the number that indicates your level of agreement or disagreement where 5= strongly agree, 4= agree, 3= neutral, 2= disagree and 1= strongly disagree.

Statement	S/A	A	N	D	S/D
<b>Section A: KOAIRWA FARMERS' ATTITUDE TOWARDS TUBURA PROJECT</b>					
1. I am satisfied with the overall operations of the TUBURA Project.	5	4	3	2	1
2. The training offered by TUBURA project was relevant to my needs	5	4	3	2	1
3 I received adequate field support from TUBURA project	5	4	3	2	1
<b>Section B: IMPLICATIONS OF FARMING INPUT AVAILABILITY, ACCESSIBILITY, AND AFFORDABILITY ON KOAIRWA FARMERS' LIVELIHOOD</b>					
<b>Farming input availability</b>					
1. I was able to find seeds easily during TUBURA project	5	4	3	2	1
2. I was able to find pesticide easily during the TUBURA project.	5	4	3	2	1
3. I was able to find fertilisers easily during the TUBURA project.	5	4	3	3	1
<b>Farming input accessibility</b>					
1. I could access seeds during the TUBURA project.	5	4	3	2	1
2. I could access pesticides during TUBURA project	5	4	3	2	1
3. I could access fertilisers during the TUBURA project.	5	4	3	2	1
<b>Farming input Affordability</b>					
1. I could afford the price of seeds during the TUBURA project.	5	4	3	2	1
2. I would afford the price of pesticides during the TUBURA project.	5	4	3	2	1
3. I was able to afford the price of fertilisers during the TUBURA project.	5	4	3	2	1
<b>Section C: Farmers 's livelihood before tubura project</b>					
<b>1. Before tubra project I could not access food</b>	5	4	3	2	1
<b>2. Before TUBURA project I could not access shelter</b>	5	4	3	2	1

<b>3.Before TUBURA project I could not access shelter</b>	5	4	3	2	1
<b>4.Before TUBURA project I could not access clothes</b>	5	4	3	2	1
<b>5.Before TUBURA project I could not access Education</b>	5	4	3	2	1
<b>Section C: Farmer' livelihood before and after TUBURA project</b>					
1. <b>After the TUBURA</b> project, I can access food.	5	4	3	2	1
2. <b>After the TUBURA</b> project, I can access shelter.	5	4	3	2	1
3. <b>After the TUBURA</b> project, I can access healthcare.	5	4	3	2	1
4. <b>After the TUBURA</b> project, I can access clothes.	5	4	3	2	1
5. <b>After TUBURA</b> project, I can access education	5	4	3	2	1

**Appendix II: Interview questions for koairwa farmers**

- 1) Have there been any changes in the affordability of farming inputs since the TUBURA Project's implementation?
- 2) What is your opinion(s) with respect to the TUBURA project, rice farming inputs availability, rice productivity and livelihood?
- 3) Have you observed any changes in the accessibility of farming inputs since the TUBURA Project was introduced?
- 4) What can you say about your livelihood before and after the TUBURA project in your farming activities?
- 5) In your opinion, what additional steps or improvements could be made under the TUBURA Project to enhance the availability, accessibility, and affordability of farming inputs for farmers in your region?

**Appendix III: Interview questions for the Key Informants**


- 1) How has the TUBURA Project impacted your cooperative and its members?
- 2) What changes have you observed since the start of the TUBURA project?
- 3) What were the primary challenges faced by your cooperative and its members before the TUBURA Project, and how has the project addressed these challenges?
- 4) What measures or collaborations have been established to ensure the accessibility of farming inputs to farmers within the target areas of the TUBURA Project?
- 5) Have you noticed any changes in the affordability of farming inputs for farmers since the TUBURA Project began? If yes, can you provide examples or insights into those changes?
- 6) As a key informant involved in the TUBURA Project, could you provide an overview of the initiatives or strategies implemented to ensure the availability of farming inputs for farmers?
- 7) What specific activities or interventions within the TUBURA Project have been most beneficial for your cooperative and its members, and why?
- 8) What role has your cooperative played in the success of the TUBURA Project, and what challenges have you faced in supporting its implementation?
- 9) How has the TUBURA Project impacted the relationship between your cooperative and other stakeholders in the community, such as government agencies or other agricultural organisations?

**Appendix III: A table that compares Koirwa farmers' livelihood before and after the implementation of the TUBURA project**

<b>Indicators</b>	<b>2017-2020 (Before TUBURA)</b>	<b>2020-2023 (After TUBURA)</b>
•Access to shelter	Low	Improved
•Access to medical services	Limited	Improved
•Access to credit	Low	Improved
•Accessibility of School fees	Poor	Improved
•Increase in market sales	Poor	Improved
• Financial services	Low	Improved
•Food security	Limited	Improved
• livestock	Limited	Improved


## Appendix IV: Research Permit

UNITED REPUBLIC OF TANZANIA  
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY



**MOSHI CO-OPERATIVE UNIVERSITY (MoCU)**  
**CHUO KIKUU CHA USHIRIKA MOSHI**

OFFICE OF THE VICE CHANCELLOR  
08 Sokoine Road, 25121 Mfumuni,  
P. O. Box 474, Moshi, Tanzania, Tel: +255 272751833,  
Email: [vc@mocu.ac.tz](mailto:vc@mocu.ac.tz), Website: [www.mocu.ac.tz](http://www.mocu.ac.tz)



*In reply, indicate:*  
**Ref. No.: MoCU/MA-CCD/HD/340/21**                      **Date: 06<sup>th</sup> June, 2023**

**To Whom It May Concern**

**RE:        JEAN BERNARD ISHIMWE**

Please refer to the above heading.

I am writing to introduce **Mr. Jean Bernard Ishimwe** who is a bonafide student persuing Master's of arts in Co-operative and Community Development (MA-CCD) at Moshi Co-operative University in Tanzania

As part of the requirements for his studies, the named candidate is planning to undertake a research project titled **"Impact of Agricultural Co-operative Based Project on Farmers Livelihood: A Case of Tubura Project in Koairwa, Rwanda"**

Any assistance accorded to him will be highly appreciated. Please do not hesitate to contact the undersigned for any information you may require.

Sincerely,

.....*John Safari*.....  
Prof. John Safari  
**FOR: VICE CHANCELLOR**

---

General: Moshi Co-operative University, 08 Sokoine Road, 25121 Mfumuni, P. O. Box 474, Moshi, Tanzania,  
Tel: +255 272751833 Email: [info@mocu.ac.tz](mailto:info@mocu.ac.tz), Website: [www.mocu.ac.tz](http://www.mocu.ac.tz)



**Appendix V: Recommendation letter**

REPUBLIQUE RWANDA  
RWANDA COOPERATIVE AGENCY  
IKURUZA KUBIHOJE GASHYamba AMAKOPERATIVE



Muhanga: 26/06/2023  
Ref: 0475/CPCBU/2023/RCA

**To Whom It May Concern**

**RE: RECOMMENDATION LETTER FOR DATA COLLECTION AND RESEARCH.**

Rwanda Cooperative Agency/RCA is recommending **Mr. Jean Bernard ISHIMWE** who is student at Moshi Co-operative university in Tanzania to conduct data collection in **KOAIRWA** cooperative as mentioned in his research proposal.

This recommendation only covers research activities related to the research topic entitled as **“Impact of Agricultural Co-operative based projects on farmers livelihood. A case of Tubura project in KOAIRWA, Rwanda”** presented from provided research proposal. RCA remind Mr. Jean Bernard ISHIMWE to conduct research in fulfillments with all requirement of research in Rwanda and work close with NISR as National institute in charge of research. Your cooperation for his successful research is highly appreciated.

Sincerely,




**MUGWANEZA Pacifique**  
**A.g Director General**  
**Rwanda Cooperative Agency**

**Appendix VI: Authorization letter**

REPUBLIC OF RWANDA

Huye on 30/06/2023  
N° 348/02.04

SOUTHERN PROVINCE  
 HUYE DISTRICT  
 E-mail : [info@huye.gov.rw](mailto:info@huye.gov.rw)  
 Ref: Education Unit

**Jean Bernard ISHIMWE**  
 Master Student  
 MoCU University

Dear Sir,


**RE: Authorization letter.**

Reference is made to your letter dated 16<sup>th</sup> June, 2023 requesting for authorization to collect data on the topic, “**Impact of Agricultural Co-operative based project on farmers’ livelihood**”; a case of **Tubura project in Koairwa, Rwanda.**

Reference is also made to the recommendation letter from MOSHI CO-OPERATIVE UNIVERSITY, authorizing you to conduct academic research for awarding a Master’s degree,

We are pleased to inform you that the authorization is granted and also we request you to share the report before publication.

Regards,

  
**Ange SEBUTEGE**  
 Mayor of Huye District

**Cc:**

- Chairperson of Huye District council.

**Appendix VII: Data collection Completion letter**

REPUBLIC OF RWANDA  
SOUTHERN PROVINCE  
HUYE DISTRICT  
MBAZI SECTOR  
EMAIL: coairwahuyc023@gmail.com  
TEL.: +250781169024

Date: 7<sup>th</sup>/7/2023

**Data Collection COMPLETION LETTER**

I hereby Undersigning that, Mr. Jean Bernard ISHMWE collected Data from Koairwa co-operative on his research entitled "Impact of Agricultural Co-operative based Project on Famers Livelihood: A case of Tubura project in Koairwa, Rwanda".

During Data collection, he interacted with farmers individually though questionnaire/survey and conducted focus group discussions with farmers and Key informants who were beneficiaries TUBURA project in Koairwa.

. We wish him all the Best for his Research Journey

Done at Huye on the 7<sup>th</sup>/7/2023.

President of KOAIRWA Co-operative

Le 8/7/2023 Nyiranzuzo Bwizigira



## Appendix VIII: Plagiarism report



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## ASSESSMENT OF AGRICULTURAL CO-OPERATIVE BASED PROJECT ON FARMERS LIVELIHOOD: A CASE OF TUBURA PROJECT IN KOAIRWA, RWANDA

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**ASSESSMENT OF AGRICULTURE CO-OPERATIVE ON THE  
IMPLICATION OF FARMING INPUT AVAILABILITY, ACCESSIBILITY  
AND AFFORDABILITY ON KOAIRWA FARMERS LIVELIHOOD,  
SOUTHERN PROVINCE, RWANDA**

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***Abstract***

*Agricultural cooperative based project serve as a vital tool for small-scale farmers and rural communities to improve their economic well-being, access markets, and collaborate for their mutual benefit. They play a critical role in ensuring the sustainability and resilience of agriculture in many regions around the world. Therefore, the study assesses the role of TUBURA Projects in agriculture co-operative specifically by examine the implication of farming input availability, accessibility and affordability on KOAIRWA farmer's livelihood. The study employed a cross-sectional research design within the southern province of Rwanda, Huye district, the research evaluates the project's influence through a multifaceted analysis. The researcher observed the sample size of 273, and the simple random sampling technique were used. The study employed both descriptive and inferential analysis especially Multiple Linear Regression Findings reveal that the Tubura project garnered positive farmer attitudes, with a notable majority expressing satisfaction with the intervention. Additionally, the availability of farming inputs, including seeds, pesticides, and fertilisers, were found to positively and significantly enhance farmers' livelihoods. Drawing from these insights, this study presents a series of recommendations aimed at amplifying the Tubura project's impact and ensuring the sustainability of improvements in farmer well-being. These recommendations encompass diverse aspects, such as expanding outreach and training programs to engage all co-operative members, addressing financial barriers to input affordability through government and stakeholder initiatives, and fostering a culture of savings among farmers to build resilience. The importance of implementing a robust monitoring and evaluation system is highlighted to continually assess project effectiveness and make timely adjustments. Finally, encouraging farmers to diversify their livelihood activities including small businesses*

***Keywords:*** Agriculture co-operative, framers, livelihood, Tubura project

## 1.0 INTRODUCTION

The impact of projects in agricultural co-operatives, including the TUBURA (grow exponentially) project in KOAIRWA (Cooperative' Abahinzib' Igishanga cya Rwasave (Rwasave Rice Farmers Co-operative), plays a critical role in farmers' livelihood. Agricultural co-operatives have been bringing people together to solve economic and social problems (Shirima, 2022). They are viewed as an engine of transforming agriculture through which the cooperative's members create employment and expand access to income-generating activities which in turn would improve the livelihood of the members (ICA, 2019). Farmers' livelihood is a global concern both in developed and developing countries. In the USA, the indicators of a good livelihood are largely absent in many farm operators (Burchfield et al., 2022). In Asia, the Vietnam Mekong Delta presents an extreme vulnerability because rice farmers often do not earn enough income for a sustainable livelihood (Tran et al., 2020). On the continent, in countries such as the Gambia, Guinea and Madagascar, sustainable rice production is the key to the improvement of livelihoods. However, the inability to achieve rice self-sufficiency in Africa, results in major constraints in the entire chain of the rice production industry (Norman and Kebe, 2006).

In Sub Saharan Africa, several factors threaten farmers' livelihood. First, farmers often receive the lowest share of the consumer dollar (Warsanga and Evans, 2018). Second, many regions in Sub Saharan Africa are characterised by declining soil fertility including the breakdown of soil structure, a reduction in organic matter and the nutrient content (Zingoree al., 2015). The cultivation of rice on the same land without addition of organic or inorganic fertilisers leads to low production, which in turn leads to inability to afford the purchase of inputs. Many international aid agencies have been trying to utilise co-operatives as a strategic means for supporting farmers. They often make use of projects to fund farming operations or to finance investments. These projects bring people and funds together to provide a broad range of services such as the provision of farm inputs to farmers (Turtiainen& Von Pischke, 1982). In Rwanda before 2007 farmers produced for home consumption; less quantity reached the market due to lack of improved seed and fertilisers, insufficient technical assistance in cropping system, postharvest technologies, soil highly degraded by erosion and lack of adequate policies in agriculture (Ministry of Agriculture 2012). To overcome the above problems, the government of Rwanda developed the National agricultural policy

(NAP) in 2004 and the National Post-Harvest Staple Crop Strategy (NPHSCS) in 2009. Farming inputs are provided to farmers through their co-operatives by the Tubura project. Agricultural cooperatives exist to assist farmers in increasing their yields and incomes by combining their resources to promote collective service provisioning and economic empowerment. Agricultural cooperatives are seen as critical in achieving the government's development targets in the Growth and Transformation Plan due to their primary mandate to contribute to smallholder farmer production, and focusing on other types of cooperatives necessitates an alternative framework for analysis (Kankindi, 2019). KOAIRWA brings together rice farmers who are among beneficiaries of the Tubura project. Tubura is a project owned by a non-government organisation known as One Acre Fund. In collaboration with Ministry of agriculture, the project has been operating with smallholder cultivators since 2009 in providing them a service bundle which include: distribution of seed and fertiliser, financing for farm inputs, Training on agricultural techniques, Market facilitation to maximise profits from harvest sales (Tuyishimire, 2015).

Despite the significant role of agriculture cooperatives, many members of agriculture cooperatives in our region face challenges in accessing essential farming inputs such as seeds, fertilisers, and pesticides, which hinders their agricultural productivity and, consequently, their livelihood improvement. Access to affordable farming inputs is a critical determinant of agricultural productivity and, subsequently, livelihood improvement among members of agriculture cooperatives (Feder et al., 2015). However, many cooperatives, especially in low-resource settings, struggle to secure consistent and reasonably priced inputs such as seeds, fertilisers, and pesticides, thus hindering their members' capacity to enhance their livelihoods (Spielman & Pandya-Lorch, 2017). Government policies and regulatory frameworks play a pivotal role in shaping input accessibility and affordability for cooperative members (Timmer et al., 2015). Inefficient policies and weak governance can exacerbate input-related challenges, inhibiting the cooperative's capacity to facilitate livelihood improvement for its members. Therefore, the study investigated the role of agriculture cooperative specifically by examining the implication of farming input availability, accessibility and affordability on koirwa farmer's livelihood southern province in Rwanda.



## **2.0 METHODOLOGY**

### **2.1 Research Design**

A cross-sectional research design was used in the study. This research design enables data collection from different groups of respondents at a time. The method helps to see how the dependent variable relates to independent variables. It further ensures a high degree of precision, reliability and validity on the data to be collected, and at the same time, the method saves time and other resources required to accomplish the study.

### **2.2 Description of the Study Area**

The study was undertaken in the southern province of Rwanda, Huye District, Rwasave marshland. We selected Rwasave marshland based on reviews of relevant literature. The literature indicated that Rwasave marshland suffers low-income generation from rice farming that results in lack of access to loan from banks for some of KOAIRWA (Kankindi, 2019). another purpose of selecting the study area is due to the fact that Rwasave marshland is the areas which constitute various TUBURA projects undertaken for improve the agricultural cooperative farmers livelihood and enable to obtained information required in a study, but also the place is essential accessible, cost effectiveness and familiarities of the key area where the researcher was able to obtain the relevant information related to the impact of agricultural cooperative based project on farmers livelihood in Koairwa, Rwanda.

### **2.3 Sample Size and Sampling Process**

The study's sampling unit comprised farmers who are beneficiary of Tabura project from koirwa co-operative. Initially, a simple random and purposive sampling technique was employed to identify the farmers so as to meet the criteria for inclusion in this study. The sample size for this study encompassed 273 farmers from Koirwa. Initially, 273 responses were randomly collected from the total population which was 864 farmers who are beneficiaries of the Tubura project to form the basis for analysis.

### **2.4 Data Collection and Analysis**

The study collected data from primary sources whereas; key informant's interviews, focus group discussions, and survey questionnaires were used. Descriptive statistics were used to analyse social demographic factors of respondents expressed in terms of percentage and frequencies. Statistical Package for Social Science (SPSS). SPSS helped to summarise data and create the appropriate tables and graphs and examine the

relationship between variables. Content analysis was used to analyse qualitative data from the study by putting together the themes that resemble, examining, and recording patterns within data to describe phenomena and how they are associated with specific questions. Also the study results were analysed by using multiple linear regression models.

## 2.5 Ethical Consideration

Conducting research that is ethical requires a commitment that lasts the whole life of the research project but also afterward, at the dissemination stage and even beyond. Clearance was obtained from Moshi Co-operative University before the commencement of the study. Thereafter, southern province Council Authorities granted its permission to undertake this study. Informed consent was obtained from all respondents before data collection in which none of the respondents refused to participate in all forms of data collection. Strict confidentiality was granted to respondents and participants had liberty to withdraw at any stage.

## 3.0 FINDINGS AND DISCUSSION

This presents a comprehensive analysis of the data derived from field research. The focus was to understand how Tubura projects in an agricultural co-operative contributes to improve the lives of the farmers, specifically by exploring the implication of farming input availability, accessibility and affordability on koirwa farmers.

### 3.1 Demographic Characteristics of the Respondents

**Table 1: Demographic information of respondents**

Items	Frequency	Percent
<b>Gender</b>		
Male	98	35.9%
Female	175	64.1
<b>Education level</b>		
Illiterate	41	15.1 %
Primary	161	59.2 %
Ordinary Level	17	6.3 %
TVET	35	12.9 %
Secondary	11	4.0 %
University	8	2.6 %
<b>Marital Status</b>		
Married	226	82.8 %
Widow	38	13.9 %
Single	3	1.1 %
Divorced	6	2.2 %

Table 1 provides an overview of the descriptive characteristics of the 273 of Koirwa farmers participating in this study. The majority of the respondents (59.2%) had completed secondary education. Additionally, the large percentage of the respondents (64.1%) were female and marital status (82.8%) the large percent were married. This information provided valuable insights and contributed to a more comprehensive understanding and helped to contextualise research findings.

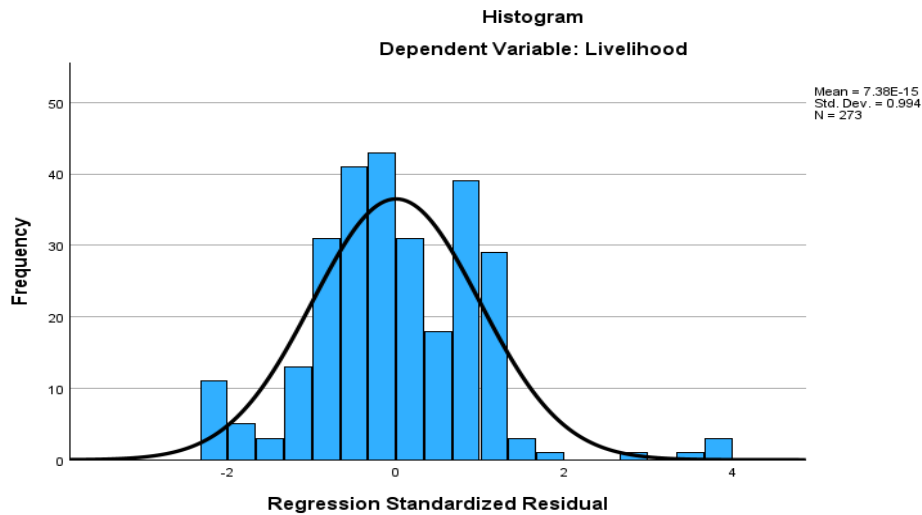
### **3.2 farming input availability, accessibility and affordability on KOAIRWA farmers' livelihood.**

The researcher thought to examine the implications of farming input availability, accessibility and affordability on KOAIRWA farmers' livelihood. This study employed the Multiple Linear Regression (MLR) model in order to predict a dependent variable (Y) using two or more predictors' variables (X) (Mark et al. 2020). Moreover, Multiple Linear Regression (MLR) allowed the researcher to make conclusions about the entire population based on data collected from a representative sample. Thus, the researcher used Multiple Linear Regression to assess the relationship between KOIRWA farmer's livelihood and farming input availability, accessibility, and affordability. As the dependent variable (farmers' livelihood) has many indicators and multiple linear regression accepts only one indicator, the researcher transformed the dependent variable using mean scores in order to get one which is representative of all. Moreover, same as the dependent variable, for the independent variables the mean transformation was also used.

#### **3.2.1 Multiple Linear Regression Assumptions**

##### ***3.2.1.1 Linearity and Normality of Data***

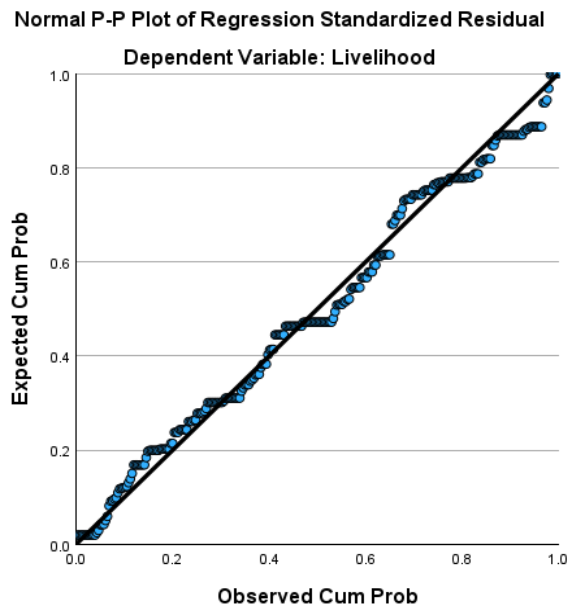
The normality assumption of multiple linear regression was checked using probability plot or histogram of residuals. The literature attested that graphical methods are significant tools for identifying deviation from the assumption of normal distribution (Chambers *et al.* 1983). Beleke (2020) states that the histogram which displays a bell-shaped curve shows that the data follow a normal distribution. As illustrated in figure 2, the results show a bell-shaped curve which shows that the residual plot appears to follow a normal distribution.



**Figure 4: Histogram of normality of Data**

### 3.2.1.2 Linearity of Data

The linearity assumptions are checked by the p-p plot of standardised residuals. Thus, normal P-P plot of regression standardised residuals show that normal probability plot for the residual is appropriately straight line. The figure 3 indicates that the regression model is approximately on the straight line and it indicates the dependent variable (Livelihood) and independents variables represent a linear relationship.



**Figure 5 : Normal p-p plot of Regression Standardised Residual**

### 3.2.1.3 Multicollinearity test

Naara (2020) argues that multicollinearity occurs in a Multiple Linear Regression analysis when there are robust correlations not only among the independent variables and the independent variable but also among the independent variables themselves. This phenomenon can result in some variables in the study losing their statistical significance.

In the context of this investigation, we evaluate the presence of multicollinearity through two primary indicators: Tolerance and the Variance Inflation Factor (VIF). The VIF in a Linear Regression model quantifies the extent to which the accuracy of regression estimates is affected by multicollinearity (Mark et al., 2020). Typically, Afundate and Alan (2023) highlight that multicollinearity is identified when the Tolerance value falls below 0.20 and the VIF value exceeds 5 within the regression model. In this particular analysis, the Tolerance values fall within the range of 0.208 to 0.754 (Tolerance >0.20), While the VIF values range from 1.326 To 4.815 (VIF<5). Therefore, based on these statistics, it is reasonable to conclude that multicollinearity is not a significant issue within the regression model.as presented in table 2 below

**Table 2 : Multicollinearity test**

Variables	Tolerance	VIF
Farming input availability	0.212	4.723
Farming input accessibility	0.208	4.815
Farming input affordability	0.754	1.326

### 3.2.1.4 Parameters estimation

**Table 3: Multiple linear regression analysis and parameter estimation farmer's livelihood and show its implication**

Parameters	Unstandardized Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.379	0.017		22.207	<0.001
Input availability	0.188	0.066	0.302	2.872	0.004
Input accessibility	0.207	0.071	0.311	2.930	0.004
Input affordability	0.013	0.028	0.025	0.449	0.754

**b. Dependent variable: Livelihood**

The table above, displays the estimated parameters of multiple linear regression model, the constant is significant (B= 0.379,  $p < 0.05$ ), this indicated that though the

predictors which are input availability, accessibility and affordability remain constant, KOIRWA farmers will still be able to make their living at 0.379.

Moreover, the findings show that farming input availability has a positive and significant impact on farmer's livelihood ( $B=0.188$ ,  $p=0.004$ ). This suggests that for every 1-unit increase in the availability of farming inputs such as seeds, pesticides, and fertilisers, farmers' livelihood is expected to increase by 0.188 units. These findings highlight that the Tubura project has helped farmers to increase farmer's livelihood by making seeds, pesticides, and fertilisers available for farmers. Furthermore, the farming input accessibility such as seeds, pesticides, and fertilisers showed a positive and significant influence on farmer's livelihood ( $B=0.207$ ,  $p=0.004$ ). This show that for every 1-unit increase in the accessibility of farming inputs, farmers' livelihood is expected to increase by 0.207 units. These findings imply the importance of accessing seeds, pesticides, and fertilisers by farmers in order to improve their livelihoods also it shows that farmers who have better access to agricultural inputs and a greater availability of inputs tend to have higher livelihoods and Tubura project played a crucial role by providing farming input to KOIRWA farmers. These results highlight that through the provision of seeds, pesticides, and fertilisers KOIRWA farmer's livelihood were increased. These results align with the findings of Abebe et al. (2017) who founds out that accessing farming inputs of quality increases the productivity and the livelihood consequently

## **4.0 CONCLUSION AND RECOMMENDATION**

### **4.1 Conclusion**

The study on the role of agriculture cooperative-based projects and the implication of farming input availability, accessibility, and affordability on farmers' livelihoods has shown that agriculture cooperatives can play a significant role in improving the livelihoods of farmers. By providing farmers with access to affordable farming inputs, agriculture cooperatives can help farmers to increase their productivity and incomes; this can lead to a reduction in poverty and hunger of koairwa farmers. The study also found that the availability, accessibility, and affordability of farming inputs have a significant impact on farmers' livelihoods. When farmers have access to affordable inputs, they are able to produce more food and earn more income. This can help to improve their standard of living and reduce their vulnerability to poverty and hunger.

Generally, the availability, accessibility, and affordability of farming inputs have a significant impact on farmers' livelihoods.

#### **4.2 Recommendations**

Governments and development organisations should support the establishment and growth of agriculture cooperative-based projects, agriculture cooperative-based projects should focus on providing farmers with access to high-quality farming inputs at affordable prices, agriculture cooperative-based projects should also provide farmers with training and support on how to use farming inputs effectively and governments and development organisations should also work to address the challenges faced by agriculture cooperative-based projects, such as limited access to finance and markets.

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