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**THE EFFECT OF EXTENSION SUPPORT PROGRAMS ON AGRICULTURAL
PRODUCTIVITY BY FARMERS IN SOUTH-KIVU, DEMOCRATIC REPUBLIC OF THE
CONGO**

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137839

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF MANAGEMENT IN
AGRIBUSINESS AT STRATHMORE UNIVERSITY**

STRATHMORE BUSINESS SCHOOL

STRATHMORE UNIVERSITY

NAIROBI, KENYA

MARCH, 2024

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a master degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

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ABSTRACT

In South Kivu, where agriculture served as the primary livelihood, the economy relied heavily on farming, fishing, and small to medium enterprises. Despite favorable conditions for agriculture, the sector remained underdeveloped, potentially due to insufficient extension support programs. Agricultural output met household needs but lacked surplus for commercial ventures. The research drew on Diffusion Innovation Theory, Financial Intermediation Theory, and Cobb-Douglas Production Function, employing a correlational research design. The study aimed to assess the impact of such programs on agricultural productivity among small-scale farmers, focusing on input supplies, technical assistance, agro-information access, and credit access. Various theories, the research employed a correlational design with a sample of 307 farmers. Findings indicate significant associations between gender and factors affecting productivity, including land access and farm input sourcing. Education levels also influenced agricultural practices, highlighting the importance of education in enhancing productivity. The research advocates for improved access to extension support programs, emphasizing the need for diverse technical assistance and alternative channels for information dissemination to unlock South Kivu's agricultural potential.

Key Words: *Farm input, technical assistance, agri-information, credit access, agricultural productivity, South Kivu*

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LIST OF ACRONYMS AND ABBREVIATIONS

AESP:	Agricultural Extension Support Programs
DIT:	Diffusion Innovation Theory
DRC:	Democratic Republic of Congo
FAO:	Food Agriculture Organization
GDP:	Gross Domestic Product
IFC:	International Financial Corporation
LAC:	Latin America and the Caribbean
SSA:	Sub-Saharan Africa
USAID:	United States Agency for International Development

OPERATIONAL DEFINITION OF TERMS

Agricultural credit:	refers to funds to support agricultural activities (Perceval <i>et al.</i> , 2017).
Agricultural productivity:	refers to increase in farm outputs as a result of growth in production inputs (FAO, 2017).
Agri-information:	Refers to Refers to access to knowledge that pertain agricultural activities (Kelil et al., 2020).
Extension services:	refers to agricultural advisory services rendered by farm technical officers to farmers including farm trainings and information about methods of farming, input, crop diseases and prevention (Moahid et al., 2021).
Farm input:	to resources utilized in farm production. In this study, it refers to farm chemicals, seeds and farm machinery (Das, Basu & Sahu, 2010).
Technical assistance:	Refers to aid and advice in regard to farming activities (Higuchi et al., 2022).

DEDICATION

This thesis is dedicated to my late beloved mum Justine KARUME, my loved siblings Gracia, Emmanuella, Wani Joana, David, Felista and Joel KAHASHA, to my dad Baudoin KAHASHA, to my loved husband Eddy BYAMUNGU and my dearest mother in law Mbila Christine. It is with immense pride and gratitude that I dedicate this thesis to you. Your unwavering support, encouragement, and belief in me have been the cornerstone of my academic journey. Your guidance has been a shining light, illuminating the path to knowledge and discovery.

Through the highs and lows of this endeavor, your presence has been a source of strength and inspiration. I am deeply grateful for believing in my abilities by pushing me to strive for excellence.

To all my beloved friends, colleagues and the rest of my family members who helped me to overcome all my obstacles I faced during this journey. This dedication is a token of my appreciation for everything you have done for me. Your support has been invaluable, shaping not only this thesis but also my academic and personal development. I am so thankful for showing up for me. Your belief in my potential has been a constant source of motivation, driving me to exceed my own expectations.

And Lastly, I dedicated this thesis to my everlasting God who guides me by given me strength, courage and protection throughout my journey. I return all the glory to you

With heartfelt thanks,

Jessica Kahasha

ACKNOWLEDGMENTS

My sincere thanks go first to my supervisor, Dr David Mathuva for his guidance during this research thesis, for all the hard work, for the trust he put in me, and for the interest given to my work since the selection of the topic. In addition, I thank him for his encouragement when facing difficulties and his commitment by helping me make this work the best it could be. My thanks also go to the team from Agricultural cooperative in south- kivu DR Congo and to Professor Borauzima from Butare University in Rwanda for providing all their support in the study. The team was willing to help during the weekends, putting in extras hours, despite their busy schedules and sometimes terrible work conditions.

My thanks go to the Strathmore University Business School (SBS) and to the Faculty of Agribusiness Management. I should also like to thank all the lecturers for their guidance and individual efforts during my scholastic journey at SBS.

CHAPTER ONE: INTRODUCTION

This chapter aims to address these challenges through a comprehensive investigation into the impact of extension support programs on agricultural productivity among small-scale farmers in South Kivu. The research delves into various facets of this issue, from identifying the underlying problems to delineating specific objectives, research questions, and the scope of the study. By shedding light on these critical aspects, this chapter sets the stage for a nuanced understanding of the complex dynamics at play and lays the foundation for subsequent chapters

1.1 Background of the Study

Low-income households and developing countries engage in a robust type of economic activity through agriculture. For the majority of households, it serves as their primary source of income. 4% of the world's gross domestic product (GDP) and more than 25% of the GDP in developing nations came from agriculture in 2018(Abbas et al. 2009). Achieving sustainable, inclusive, and healthful food systems also depends heavily on agriculture. Growth in agricultural activities is strongly tied to the United Nations Sustainable Development Goals on zero poverty, zero hunger, excellent health and wellbeing, decent work, and economic growth (FAO, 2019). A predicted 9.7 billion people will need to be fed by 2050, and one of the most effective ways to reduce extreme poverty and promote shared prosperity is through agricultural growth, according to World Bank (Abi-Ghanem et al. 2013).

Globally, three quarter of the poor people live in country areas and over 80% of them rely on farming both directly and indirectly to sustain their livelihoods through income and employment activities offered by agriculture(Science 2020). Therefore, investment in agriculture is critical for economic growth and sustainable development. More investment to the sector has largely been viewed by stakeholders as the significant way of alleviating poverty and fostering food security (Twumasi et al. 2022). Despite the significance of agriculture to the economy and livelihood of the agricultural dependent households, the sector has been neglected in particularly in the rural areas where access to agricultural extension support programs like technical training, farming information, affordable credit and farm input(Birner, Daum, and Pray 2021).

Farming postponement programs have been one of the main conduits of supporting the livelihoods of the agricultural dependent households. The agricultural extension support programs (AESP) are the avenue of transferring technical advice, assist engaging farmers in the agricultural knowledge

and information system and assisting them in solving problems(Acosta et al. 2021). According to FAO, extension refers to the systems that help farmers, their organizations, and other market participants obtain knowledge, information, and technologies; help them communicate with partners in agribusiness, research, education, and other pertinent institutions; and help them build their own technical, organizational, and management practices(Akhtar et al. 2019).

Agriculture in South Asia is dominated by small scale farmers, several of them are engaged in subsistence farming and they are at risky to inefficient government dominated markets and local markets exploited by intermediaries (Sánchez-cañizares, Guerrero-baena, and Gómez-limón 2021). Approximately 60 percent of South Asia's 1.8 billion citizens are involved in agriculture. Bangladesh, India, Afghanistan and other countries depend heavily on the agricultural sector for their economic prosperity(Arsene and Nkulu Mwine Fyama 2021). Despite agriculture being a major source of livelihoods of households in South East Asia, access to agricultural extension support programs remain a challenge to many farmers(Badiru 2010). According to Consortium of International Agricultural Research Centers (CGIAR) (2023), many farmers face challenges accessing markets, extension information and credit in the region. Furthermore, financial institutions are not spread across the local villages in South East Asia thus farmers are deprived of credit access to their sustainable farming(Zikhali et al. 2020).

The agricultural industry in Latin America and the Caribbean (LAC) is essential to the production of food and ecosystem services that benefit the entire world as well as the region(Dibakoane, Siyongwana, and Shabalala 2022). In 20 LAC nations, the agricultural sector accounts for 5–18% of GDP; this percentage rises when broader contributions throughout food systems are taken into consideration (World Bank, 2020). Although agricultural output accounts for the majority of economies in LAC, access to technical support services and rural extension is often restricted in rural areas (Rio, 2023). Yet, despite agriculture's vital role in the livelihood of the people in the Latin American and Caribbean region, it faces obstacles such as a lack of access to agricultural skills, modernized agri-logistics infrastructure (including ICT), agricultural credit, and other farm input(Dharmasiri and Datye 2011). Furthermore, rural financial markets for most parts remain underdeveloped, shallow and non-competitive (Arsene and Nkulu Mwine Fyama 2021). Although, Latin America is most urbanized region among the developing economies, 30% of the population still live in rural areas and practice agriculture (Baffoe et al. 2009). Sub-Saharan region has not fully taken advantage of cross border trade that offered opportunities ranging from flow of goods

and services, capital, technology, ideas and people to boost growth and alleviate poverty through improved productivity and efficiency, providing access to new markets and create more consumer choices(R. Islam 2015). Majority of rural people in Sub-Saharan Africa (SSA) depend on agricultural economic activities for livelihood yet the sector is highly underdeveloped. In Sub-Saharan Africa an estimated 80% of all farms are smallholder subsistence or semi-subsistence farms(Yan and Zhang 2024). 70% of the African countries depend on agriculture for full time employment and others for income generation and still over 200 million people are food insecure (Garrity *et al.*, 2020). In spite agriculture being critical to the economies and livelihood of African economies and households, agricultural productivity remains underdeveloped. The African region has 25% of world potential arable land for arable agriculture but only 27.8% of arable land is under cultivation which has been linked to inadequate agricultural extension services and poor capital mobilization to leverage agriculture(Balasha et al. 2023).

In Ghana, 52% of the population depend on agriculture FAO yet only less than 7% of the farmers can access agricultural extension services(Benin, Wood, and Nin-Pratt 2016). In Tanzania, less than 11% of farmers can access agricultural extension services. In Uganda, subsistence farming is the main source of income for the majority of the population—over 85% of whom live in rural areas, along with 80% of the impoverished(Hoque et al. 2023). But access to extension support services remains a major problem affecting agriculture averaging 5 visits in a year. In Kenya, agricultural related activities form a significant portion of the economic activities and source of livelihood for many households. As the backbone of the 60 percent of jobs and 65 percent of exports are generated by the agriculture sector in Kenya, which also provides 51 percent of the country's GDP (25 percent directly and 25 percent indirectly). However, the government's once-free agricultural extension program has disintegrated in recent years. For smallholder farmers, solutions in the private sector can occasionally be too costly(Dibakoane et al. 2022).

Despite having vast areas of land that could be productive for agriculture, the Democratic Republic of the Congo (DRC) is still undeveloped. The Democratic Republic of Congo has the potential to become a major agricultural force in the world thanks to its 80 million hectares of arable land, 4 million hectares of irrigated land, and several rivers with significant fisheries resources (International Trade Administration, 2022). Nonetheless, in the Democratic Republic of the Congo, where 75% of the population depends on agriculture for a living, just 13% of the fertile land is used for farming(Zikhali et al. 2020).

Level of food insecurity in DRC

As of my last update in January 2022, the Democratic Republic of the Congo (DRC) has faced significant challenges regarding food insecurity (Tebali Daemane and Brian Muroyiwa 2022). The country has experienced prolonged conflict, political instability, displacement of populations, and inadequate infrastructure, all of which have contributed to food insecurity. According to reports from organizations like the Food and Agriculture Organization (FAO) and the World Food Programme (WFP), millions of people in the DRC are food insecure, with a large portion of the population facing severe hunger and malnutrition. Conflict-affected areas and regions with limited access to agricultural resources are particularly vulnerable (Daly et al. 2016). Factors such as poor infrastructure, limited access to markets, and environmental degradation further exacerbate food insecurity in the country. Additionally, natural disasters, such as floods and droughts, can disrupt agricultural activities and exacerbate food shortages. It's important to note that the situation regarding food insecurity in the DRC may have evolved since my last update (Danso-Abbeam, Ehiakpor, and Aidoo 2018).

Access to agricultural extension services in DRC remains a problem to small scale farmers with access to extension services skewed towards male farmers compared to female farmers (Lambrecht et al., 2016). According to Balasha et al. (2022) lack of information and ineffective extension services are the major hindrances to the agricultural productivity in DRC. Though Lambrecht et al. (2016) and Balasha et al. (2022) points out agricultural extension support as hindrance to agricultural production in DRC, the studies fail to indicate the exact impact of agricultural extension support programs on agricultural productivity in the region indicating both empirical and methodological gap. Furthermore, Daly *et al.* (2016), farmers in DRC are confronted with two main challenges that include the unfamiliarity with the agriculture sector and lack of financial expertise tailored to the agriculture sector an indication of contextual gaps. Access to credit remains the greatest impediment for actors in agricultural sector across the DRC (Das, Basu, and Sahu 2010). but has not been sufficiently studied by scholars and how it affects agricultural productivity in DRC presenting conceptual gap.

Agricultural Extension Support Programs

In the research context of "the effect of extension support programs on agricultural productivity by farmers in South Kivu, Democratic Republic of the Congo," agriculture productivity can be defined as the measure of output or yield obtained from agricultural activities within a given area or timeframe. This encompasses various aspects such as crop yield, livestock production, and overall farm output. Agriculture productivity reflects the efficiency and effectiveness of agricultural practices and interventions in generating sufficient quantities of food, fiber, or other agricultural products to meet the needs of farmers and consumers (Dharmasiri and Datye 2011). It can be influenced by factors such as land quality, climate conditions, availability of inputs (e.g., seeds, fertilizers, machinery), access to markets, adoption of modern agricultural techniques, and the level of support provided through extension programs (Mavole 2020). Improving agriculture productivity is essential for enhancing food security, increasing incomes for farmers, and promoting sustainable agricultural development.

The drives of the agricultural productivity in general

In the Democratic Republic of the Congo (DRC), several factors influence agricultural productivity. Here are some key drivers:

Access to Inputs: Availability and affordability of agricultural inputs such as seeds, fertilizers, pesticides, and machinery significantly impact productivity. Access to high-quality inputs can enhance crop yields and overall farm output.

Land Management: Effective land management practices, including soil conservation, land preparation, and irrigation, play a crucial role in boosting agricultural productivity. Sustainable land management practices help maintain soil fertility and mitigate the effects of erosion and degradation.

Technology Adoption: Adoption of modern agricultural technologies and techniques, including improved crop varieties, mechanization, and precision agriculture, can lead to higher productivity. Technology transfer and extension services are essential for facilitating the adoption of innovative practices among farmers.

Infrastructure Development: Adequate infrastructure, such as roads, storage facilities, and market linkages, is essential for supporting agricultural productivity. Improved infrastructure

enables farmers to access input markets, transport their produce to markets, and access information and extension services more efficiently.

Access to Finance: Access to credit and financial services enables farmers to invest in agricultural inputs, machinery, and infrastructure, thereby increasing productivity. Financial inclusion initiatives targeted at smallholder farmers can facilitate access to finance and improve productivity.

Policy Support: Supportive policies and regulatory frameworks that prioritize agriculture, provide incentives for investment, and promote market access can stimulate productivity growth. Policies addressing land tenure, trade regulations, agricultural research and development, and extension services are crucial for enhancing agricultural productivity.

Climate Resilience: Building resilience to climate change and variability is essential for sustaining agricultural productivity in the face of changing climatic conditions. Climate-smart agriculture practices, such as drought-resistant crop varieties, water management strategies, and agroforestry, can help mitigate the impacts of climate change on agriculture (Fan et al. 2013).

Education and Training: Investing in education and training for farmers, extension workers, and agricultural professionals enhances their capacity to adopt and implement best practices, leading to improved productivity. Training programs on agronomic practices, post-harvest management, and business skills empower farmers to make informed decisions and improve their livelihoods. The Democratic Republic of the Congo (DRC) has agricultural extension programs aimed at providing support and assistance to farmers to improve their agricultural practices, increase productivity, and enhance food security (Fan et al. 2013). These extension programs typically involve government agencies, non-governmental organizations (NGOs), international organizations, and sometimes private sector entities. According to the Food Agriculture Organization 2010, Extension Support Programs are those that help farmers, their organizations, and other market participants gain access to knowledge, information, and technologies; help them communicate with partners in agribusiness, research, education, and other pertinent institutions; and help them build their own technical, organizational, and management practices (Mulume Bonnke et al. 2022). In addition to providing farmers with the services and inputs they need to support their agricultural output, an agricultural extension service provides expert advice on agriculture (FAO, 2010). It transfers new ideas created by agricultural research stations to farmers and gives them information (Mulumeoderhwa Munyakazi et al. 2022).

Christoplos (2010) claims that technical knowledge is included in extension support programs, along with facilitation, coaching of various actors to increase production, postharvest management, market access, handling of shifting risk patterns, and environmental protection. One program that helps farmers, value chains, and market participants get knowledge is agricultural extension. It's also one avenue that could help close the productivity gap. Regarding the function of extension services, they frequently let farmers organize into groups, collaborate with numerous organizations, and help them sell their agricultural goods (Mwonge and Naho 2022).

By bridging the knowledge gap between individual farmers and extension professionals, extension services may help to boost productivity and raise household income (Norton & Alwang, 2020). Any national agricultural extension program's goal is to increase farmers' yields through the adoption of new or improved farming techniques, technologies, and procedures. Agricultural extension dramatically increases technical efficiency by 4.8% to 7.6%, claim. Furthermore, Kosim showed that by enhancing farmers' technical capacity, agricultural extension raises smallholder farmers' productivity (Ciza et al. 2021).

While some studies have mentioned agricultural extension services as critical to the agricultural productivity, few studies have attempted to determine the actual effect of agricultural extension support programs on agricultural productivity. Kosim showed in Indonesia, farmers who took part in agricultural extension were more productive than those who did not (Zenda Za Begani Arthur-Josué, Faustino, and Godfrey 2020). However, there are notable differences in farm production between national features, land factors, sociodemographic factors and agricultural extension model specification an indication of contextual gap. Mbise indicated that extension services result to increased agricultural production of maize in Tanzania. Similar assertion is held by Danson agricultural extension programs enhance agricultural productivity. Though Danso-Abbeam et al. (2018) and Mbise (2019) agricultural extension programs affect agricultural productivity, differences in socio-demographic, institutional and farm-specific factors may affect the provision of agricultural extension services across societies.

A crucial aspect of agriculture extension services is access to reasonably priced credit support, which has not been thoroughly examined by previous researchers (Mbise, 2019; Lee et al., 2020; Kosim et al., 2021), suggesting a conceptual gap. There is broad agreement among academics that finance availability is a critical driver of agricultural productivity and expansion (Mgbenka et al.,

2016; Ankrah Twumasi et al., 2020). Thus, financing for agriculture and financial literacy are critical for increasing agricultural output. According to Saqib et al. (2018), agricultural financing is an essential component of contemporary technology for raising farm productivity. The fact that less credit is being given to a sector in the DRC that accounts for more than 80% of the region's GDP raises serious concerns (USAID study, 2022).

According to Bonnke et al. (2022), the majority of South Kivu's farmers (97.2%) obtain their agricultural loan via unofficial sources, with a low percentage of access (20.6%) among farmers.

1.1.2 Agricultural Productivity

Because it contributes to a robust and healthy economy, productivity—which measures the increase in outputs not offset by the growth in production inputs—is a closely monitored economic performance indicator (FAO, 2017). Given the relationships between productivity, output prices, and competitiveness in the agriculture sector, rising productivity levels are encouraging for the sustainability of the farm sector (Odhiambo et al., 2003). At least initially, higher production can result in higher farm income. Over time, as more farms use more productive inputs and methods, the supply of output rises and farm income and output prices may decline (Fuglie, 2018). Increasing productivity and/or inputs can lead to an increase in agricultural production.

Raising agricultural productivity and accelerating agricultural growth are commonly promoted as core objectives of farmers (Benin, 2016). The agricultural productivity in developing economics in Africa, Latin America and majority of Asian countries lag behind overall economic growth, and agricultural performance falls below that of developed economies particularly those in OECD. Low productivity in agriculture across developing economies is as result of adopting poor technology which can be improved by leveraging on agricultural extension services. In DRC, Agriculture is the foundation of the economy, employing 70 percent of the total work force (Tanguy et al., 2020). Despite the country's heavy reliance on agriculture, agricultural yields remain low in many regions contributing only contribute 19.04 percent to the GDP (Global Economy, 2021) yet 80 percent of the DRC land is arable.

1.1.3 Farming in South Kivu

The Democratic Republic of the Congo's South Kivu is an agro-pastoral zone mostly known for small-scale agriculture. In the Democratic Republic of the Congo, farming continues to be the primary source of income for households. Eighty percent of South Kivu's economy comes from

small and medium-sized businesses, agriculture, and fishing (Angélique et al., 2022). Neema et al. (2021) report that 91% of South Kivu households' total income comes from agricultural activities, which they rely on virtually exclusively. This region helps to the food security of the people living in South Kivu and the surrounding territories because of its potential and location (Munyakazi et al., 2022).

South Kivu Province's urban population makes up 5% of the DRC's total urban population, while the province's majority, 78.4%, is in rural regions (UNDP, 2009). These particulars show that agricultural development in South Kivu is essential to maintaining livelihoods, as many people in the province depend on it for their livelihoods (Mushagalusa, & Fyama, 2021). South Kivu was selected because, in comparison to other DRC regions, it depends more on agriculture. Furthermore, 91% of South Kivu agricultural households produce cassava, while 52% produce maize, 32% produce beans, 25% produce groundnuts, 5% produce bananas, and 5% produce rice. The region is fertile and conducive to agriculture and livestock cultivation (USAID, 2018).

Despite the favorable climatic conditions and soil fertilities for agricultural activities in South Kivu, the agricultural sector is highly underdeveloped. The agricultural output is only sufficient for household consumption without or limited extra for commercial and additional income generation. The constraint agricultural productivity in South Kivu has been linked to myriad of factors. According to Angélique et al. (2022), problematic access to land and ineffective family labor undermines agricultural productivity in South Kivu while Munyakazi et al. (2022) identified limited farmers' associations, size of landholdings and cultivated land, the cropping system, the use of land, farms' economic performance and interethnic conflicts. For Balasha et al. (2023), climate change and deteriorating land fertility affect agricultural productivity in South Kivu whereas Arsene and Fyama (2021) indicated that floods, pest infestation, crop destruction, militia resurgence, unsecure land-holding status as well as the decrease in soil fertility were undermining agricultural productivity in the region.

Though the studies have attempted to interrogate the factors that are affecting agricultural production in South Kivu, the studies have not narrowed down to access to extension support programs and their effect on agricultural production with particular focus to access to technical advice, agricultural information and technologies, agricultural training and management skills, access agricultural membership group an indication of conceptual limitation in their studies. Furthermore, access to markets and agricultural credit and its impact on agricultural productivity

were not studied by the past scholars in the region. Only Munyakazi et al. (2022) mentioned access to finance, creation of infrastructures, and enhancement of strong and dynamic membership associations would allow small-scale farmers to enhance agricultural production in South Kivu but did not establish the actual effect of these factors on agricultural production presenting methodological limitation of the study. Munyakazi et al. (2022) found that 39.8% of farmers' association members reported that the benefits of their associations included access to small loans and peer support during positive and negative events, collective bargaining power, mutual assistance, specific training on agricultural practices, and certain donations, grants, and subsidies (such as seeds, farmyard animals, and agricultural equipment).

1.2 Problem Statement

In DRC, agriculture is the foundation of the economy, employing 70 percent of the total work force (Tanguy et al., 2020). Despite the country's heavy reliance on agriculture, agricultural yields remain low in many regions contributing only contribute 19.04 percent to the GDP (Global Economy, 2021) yet 80 percent of the DRC land is arable. According to World Food Programme (2022), only 13% of the arable land in DRC is under agricultural activities where 75% of the people depend on agriculture for livelihood. In South Kivu, small scale farming remains the main source of livelihoods for many households. The economy of South Kivu is 80% reliant on agricultural activities, fishing as well as small and medium enterprises (Angélique et al., 2022). However, according to Neema et al. (2021) South Kivu households depend almost entirely on agriculture and their agricultural activity makes up 91% of the overall household income.

In spite of the favorable climatic conditions and arable land for agricultural activities in South Kivu, the agricultural sector remains underdeveloped. The agricultural output produced is only for subsistence without or limited commercialization of the agricultural sector more household income. The constraint agricultural productivity in South Kivu has been linked to various elements by different scholars. For instance, problematic access to land and ineffective family labor undermines agricultural productivity in South Kivu (Angélique et al., 2022), climate change and deteriorating land fertility (Balasha et al., 2023), limited farmers' associations, size of landholdings and cultivated land, the cropping system, the use of land, farms' economic performance and interethnic conflicts (Munyakazi et al., 2022) and floods, pest infestation, crop destruction, militia resurgence, unsecure land-holding status as well as the decrease in soil fertility (Arsene & Fyama,

2021). Though the studies have attempted to interrogate the factors that are affecting agricultural production in South Kivu, the studies have not narrowed down to access to extension support programs and their effect on agricultural production with particular focus to access to technical advice, agricultural information and technologies, agricultural training and management skills, access agricultural membership group an indication of conceptual limitation in their studies. While some studies have mentioned agricultural extension services as critical to the agricultural productivity, few studies have attempted to determine the actual effect of agricultural extension support programs on agricultural productivity. However, farm productivity significantly differs in country level characteristics, land factors, sociodemographic factors and agricultural extension model specification an indication of contextual gap. In South Kivu, access to markets and agricultural credit and its impact on agricultural productivity were not studied by the past scholars in the region. It is against this that the proposed study seeks to determine the effect of extension support programs on agricultural productivity among small scale farmers in South-Kivu, DRC.

1.3 Research Objectives

The study was guided by the main and specific objectives as follows;

1.3.1. General objective

The general objective of the study is to determine the effect of extension support programs on agricultural productivity among small scale farmers in South-Kivu, DRC.

1.3.2. Specific Objectives

The specific objectives are to;

- (i). To assess the extent to which extension support programs, including farm input supplies, technical assistance, agro-information access, and credit access, are reaching small-scale farmers in South Kivu.
- (ii). To evaluate the impact of extension support programs on key indicators of agricultural productivity, among small-scale farmers in South Kivu.
- (iii). To identify the factors influencing the effectiveness of extension support programs in enhancing agricultural productivity in South Kivu, Democratic Republic of the Congo.
- (iv). To explore the institutional and policy factors that shape the effectiveness of extension support programs in enhancing agricultural productivity in South Kivu.

1.4 Research Questions

- (i). To which extent the extension support programs, including farm input supplies, technical assistance, agro-information access, and credit access, are reaching small-scale farmers in South Kivu.?
- (ii). What is the impact of extension support programs on key indicators of agricultural productivity, among small-scale farmers in South Kivu?
- (iii). What are factors influencing the effectiveness of extension support programs in enhancing agricultural productivity in South Kivu, Democratic Republic of the Congo?
- (iv). What are the institutional and policy factors that shape the effectiveness of extension support programs in enhancing agricultural productivity in South Kivu?

1.5 Scope of the Study

The study was delimited to examining the effect of extension support programs on agricultural productivity in South-Kivu, DRC. While extension support programs encompass various aspects, this study focused specifically on the impact of farm input access, technical assistance, agri-information access, and credit access on agricultural productivity in South-Kivu, DRC. Scholars had not previously investigated the combined effects of farm input access, technical assistance, agri-information access, and credit access in South Kivu, DRC. Geographically, the study targeted farmers registered in cooperatives in South Kivu, DRC. The South Kivu region includes four localities: Bugorhe, Irhambi, Mbinga Sud, and Mbinga Nord. These localities are home to 1,324 registered farmers in agricultural cooperatives. The study was conducted over a period of 7 months, from March 2023 to September 2023.

1.6 Significance of the study

The study shall be significant to practice, policy and research.

1.6.1 Significance to Practice

Access to extension services by farmers was significant to agricultural production. The study provided information that helped farmers seek extension support services like quality and affordable farm input access, technical assistance, agri-information access, and credit access from government, non-government, and private service providers of extension support services. The

study also helped farmers commercialize farming and reap more benefits that were associated with employing modern farming methods in enhancing productivity.

1.6.2 Significance to Policy Makers

This study served as a useful information tool for policymakers as they developed appropriate policies to enhance the provision of agricultural extension support services. Industry players and firm leaders used the findings in this study to better understand dynamics and uncertainties the agricultural sector faced so that agricultural extension support services could be packaged in a way that reached many small-scale farmers in South Kivu. The study was of help to cooperative societies in terms of setting up policies that guided farmers from registration to enjoying full membership rights.

1.6.3 Significance to Research

This study usefully and significantly contributed to inform scholars as a reference for further studies on extension support programs and agricultural productivity in conflict-ravaged areas like South Kivu, DRC.

1.7 Summary for the chapter

The chapter presented an in-depth synthesis of extension support programs and how it impacts agricultural productivity on global, regional and local perspective. Research gaps emanating from past scholars in regard to extension support programs and agricultural productivity with specific focus on small scale farming in South Kivu was uncovered. The statement of the problem was formulated supported by statistics and research gaps. The chapter proceed to outline the significance of the study to small scale farmers, policymakers through the government and future research. The chapter ended by presenting an organization of the study.

1.8 Organization of the Study

The study was organized into five chapters. Chapter one covered the background of the study, problem statement, study objectives, scope of the study, significance of the study, as well as the organization of the study. The second chapter examined the theoretical literature, empirical literature of the study, critique of the literature review and research gaps, conceptual framework, and operationalization and measurement of variables. The third chapter deliberated on the research methodology that was employed to achieve the study objectives. Chapter three outlined the

research philosophy, research design, population, sample size and sampling technique, data collection methods, data analysis, research quality, and ethical considerations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The hypotheses guiding the suggested study were discussed in this chapter. In order to identify research gaps, comprehensive critical assessments of earlier studies were conducted under the direction of the study objectives. A conceptual framework and an operationalization of the study variables were presented as the chapter came to the end.

2.2 Theoretical Framework

the conceptual framework outlines the relationship between independent variables and the dependent variable. The independent variables encompass factors such as farm input supplies, technical assistance, agro-information access, and credit access, which are presumed to influence agricultural productivity. These variables represent the support and resources provided to farmers through extension programs. The dependent variable, agricultural productivity, reflects the outcome or result of these interventions, indicating the level of output or yield obtained from agricultural activities. By examining the impact of farm input supplies, technical assistance, agro-information access, and credit access on agricultural productivity, the conceptual framework aims to elucidate the mechanisms through which extension support programs influence the farming outcomes in South Kivu, Democratic Republic of the Congo. The study was anchored on Diffusion Innovation Theory, guided by Financial Intermediation Theory, and employed the Cobb-Douglas Production Function.

2.2.1 Diffusion Innovation Theory

The Diffusion Innovation Theory (DIT) was brought forward by Rogers (1962) is based on the notion that innovation entails the planned or spontaneous spread of ideas. The diffusion of innovations theory describes the pattern and speed at which new ideas, practices, or products spread through a population. Innovation diffusion theory focuses on understanding how, why and at what rate innovative ideas and technologies spread in a social system. The diffusion of innovations theory outlines how new technological and other advancements spread throughout societies and cultures.

Regarding innovation adopters, the DIT assists in understanding the user adoption of different innovations in target populations. Karnowski and Kümpel (2016) found five adopters who adopt

the technology/innovation during its diffusion into the social system. These five types of people are differentiated based on time dimension (Dearing & Cox, 2018). The categorization includes innovators, early adopters, early majority, late majority, and laggards. The innovators are people readily willing to imbibe new ideas and products, while laggards are skeptical about innovations. The major limitation of the diffusion of innovations theory is that; it is often simplified to focus solely on a product or innovation, disregarding the complex societal, cultural, economic and other factors that determine how the product is adopted into society.

Understanding how new inventions, ideas, and concepts are used in the agriculture sector requires an understanding of the innovation diffusion hypothesis. The theoretical foundation of agricultural extension is diffusion theory. The goal of extension has historically been to raise agricultural productivity and output through the dissemination of pertinent knowledge and information as well as the provision of technical and financial guidance. This method is known as the diffusion strategy. The diffusion research gave agricultural researchers feedback on how well the agriculture extension support services—such as the supply of high-quality, reasonably priced farm input, technical help, and access to agri-information—were working.

2.2.2 Financial Intermediation Theory

Gurley and Shaw (1960) postulated the Financial Intermediation Theory. The financial intermediation theory attempts to bridge credit rationing theory on account of information asymmetry. Imperfections that exist in the market are as a result of information asymmetry a sharp contrast from Arrow-Debreu view of perfect market (Ingrao & Sardoni, 2020). The transaction costs that arise because of information asymmetry between lenders and borrowers are remedied by financial intermediaries (Shittu, 2012). The financial intermediation is geared toward credit rationing (Woodford, 2010) by minimizing transaction costs by providing useful information to those in the unknown side on time (Levine, 2005). In the absence of financial mediators/intermediaries, imperfect markets as a result of information asymmetry are created invalidating the views of Arrow-Debreu of perfect markets (Arrow & Debreu, 1954).

However, the Financial Intermediation Theory has been criticized for heavily focusing on the roles of financial entities which are no longer applicable to mature and developed financial systems (Scholtens & Van Wensveen, 2000). The perception that intermediaries come to reduce information asymmetry cutting down the transaction costs is increasingly becoming less applicable

and relevant (Scholtens & Van Wensveen, 2003). According to Allen and Santomero, (2001), view that financial intermediaries only focuses on two roles; transferring risks and dealing with complex financial issues at the marketplace but with little explanation on the reason why the financial entities in question should undertake the task and reducing participation costs that are incurred in day to day financial operations at the market.

The financial intermediation theory is useful in understanding the access of affordable credit by farmers through cooperatives. Farmers' cooperatives reduce the transaction costs that would have been incurred at seeking financial services without proper market knowledge. Financial intermediation therefore helps eliminate costs associated with information asymmetry. In the case of the study, the existence of farmers' cooperatives helps reduce the information asymmetry that exists between financial lending institutions and potential farmers who seek credit services at an affordable cost.

2.2.3 Cobb-Douglas Production Function

The relationship between an output and its inputs is commonly represented by the Cobb-Douglas functional form of production functions. Knut Wicksell (1851–1926) made the proposal, and Charles Cobb and Paul Douglas (1928) tested it against statistical data. Charles Cobb and Paul Douglas proposed in 1928, as referenced by Ghoshal and Goswami (2017), that the quantity of labor and physical capital invested as input determines the production output. The linkages between its inputs—physical capital and labor—and the volume of output produced are reflected in the Cobb-Douglas production function (Miller, 2008). It is a tool for figuring out how adjustments to inputs will affect yields, pertinent efficiency, and production activity levels. The labor, capital, land, technology, and other inputs that go into producing a total output are all related to each other through the production function. The function represents the relationship in technology between the quantity of one or more inputs and the quantity of output that can be generated from those inputs. It defines the level of production output from a particular quantity of factor inputs at the current technological stage of knowledge. To put it another way, a production function is just a collection of guidelines or methods for combining inputs and outputs. The Cobb-Douglas Production Function is a useful tool for calculating output levels depending on input levels, but its application in estimating agricultural production is limited (Dharmasiri & Datye, 2011). For much the same reasons that led to the function's original development—namely, that it

is easy to estimate but permits diminishing marginal returns to each input—agricultural economists today only employ significantly modified versions of the Cobb Douglas production function (Yang et al., 2020). The impact of agricultural output in South Kivu and how extension services affect it were tested using this model. Projecting agricultural productivity based on the region's access to farm input was made easier by the Cobb-Douglas function.

2.3 Empirical Review

An empirical investigation of earlier research on the study's topic is presented in this part. The sections outline how agricultural productivity and extension support initiatives are conceptualized. The study objectives have guided the conduct of the empirical literature review. The purpose of the study criticism was to identify areas that still needed inquiry.

2.3.1 Access to farm input and agricultural productivity

Access to farm inputs is pivotal in determining agricultural productivity globally, spanning regions like Europe, Asia, Africa, Sub-Saharan Africa, and notably, the Democratic Republic of the Congo (DRC). In developed countries, well-established agricultural input supply chains ensure farmers have easy access to high-quality seeds, fertilizers, pesticides, and machinery, facilitated by supportive government policies and subsidies. Conversely, smallholder farmers in developing nations encounter obstacles due to limited market infrastructure, financial constraints, and deficient extension services, hindering their access to affordable and quality inputs. Asia, boasting diverse agricultural systems, including smallholder and commercial farming, witnesses concerted efforts in countries like China and India to bolster input accessibility through subsidies, extensions, and market interventions. However, challenges persist, especially in remote regions. In Africa, including Sub-Saharan Africa, access to inputs varies, with factors such as poor infrastructure and inadequate extension services impeding farmers' access. The DRC faces similar challenges exacerbated by limited infrastructure and political instability, constraining access to modern inputs. Extension support programs are pivotal in mitigating these constraints and fostering sustainable agricultural practices. Overall, ensuring universal access to farm inputs is imperative for enhancing agricultural productivity and food security globally, with regional disparities necessitating tailored interventions to address local challenges effectively.

One of the biggest issues facing small-scale farmers worldwide is access to agricultural machinery, manpower, fertilizer, seeds, pesticides, herbicides, and rodenticides. Angélique et al.'s study from

2022, which examined the role of agricultural development in the fight against poverty in South Kivu, the Democratic Republic of the Congo, revealed that restricted family labor and very small farms make land access a challenge. This study used a standardized questionnaire to interview 120 families. There was a conceptual gap in the study since it did not address how family labor and land access affected agricultural productivity.

Munyakazi et al.'s (2022) study of 211 farmers in South Kivu, the Democratic Republic of the Congo, described small-scale farming as an engine of agricultural development. Data were collected via a formal questionnaire. It was discovered that the number of plots on a farm, the cropping system, the production techniques selected, the tenure of the land, the gross margin, the gross value added, and the net farm income attained at the farm level are the factors that differentiate farms. The study conducted by Munyakazi et al. (2022) highlighted that small-scale farmers in South Kivu could increase agricultural production through improved membership associations, infrastructure development, and access to financing. However, the study did not determine the precise impact of these factors on agricultural production, indicating a methodological limitation.

Additionally, Arsene and Nkulu (2021) looked on farmers' coping mechanisms and possible hazards to agricultural food production in the marshlands of Kabare, Democratic Republic of the Congo. The study used descriptive statistics and the binary logit model to examine survey data from 148 farmers. Floods, pest infestation, crop theft, insecure land ownership, and declining soil fertility were among the threats to agriculture that the study highlighted. The basic aim of the study was to suggest viable solutions for improving agricultural output; however, it did not demonstrate the actual impact on productivity, indicating a methodological gap.

Kosim et al. (2021) assess the effect of agricultural extension on smallholder sugarcane farmers' productivity in East Java, Indonesia. 2,893 farmers participated in the survey study, of whom 2,463 served as the control group and 430 as the treatment group. By using propensity score matching, it was discovered that farmers who took part in agricultural extension were able to obtain high-quality farm input, such as seeds, and as a result, their production was 9.05 tons higher than that of farmers who did not. However, there are notable differences in farm production when it comes to country-level attributes, land-related factors, sociodemographic factors, and the specifications of agricultural extension models, all of which point to contextual gaps.

Africa's smallholder farmers' access to financing and inputs was investigated by Langyintuo (2020). This was mostly caused by a lack of utilization of contemporary technology, which is a byproduct of restricted access to agricultural financing. Examples of these technologies include improved crop varieties, fertilizers, and other complementing inputs. The lack of availability to high-quality farm input was noted as one of the difficulties facing agricultural productivity in Africa by the study. The study's purview was broad. Other elements that impact agricultural production include sociodemographic variables and the model of agriculture extension services that is used to indicate a contextual gap.

According to Iraqi extension agents' perceptions, Abi-Ghanem et al. (2013) looked at the availability of agricultural inputs, knowledge and technology, interacting with farmers, and the place of women in agriculture. Over 83% of program participants concurred that access to agricultural inputs was currently insufficient to properly promote productive agricultural practices, even if they perceived a noticeable improvement overall in access to agricultural supplies and technology. Other elements that impact agricultural production include sociodemographic variables and the model of agriculture extension services that is used to indicate a contextual gap. Meja and Kebede (2022) investigated how the production of key crops in Southern Ethiopia was affected by the usage of agricultural inputs. This panel study looked at data from 2011 to 2015. It was discovered that households who used fertilizer produced more than those who didn't. Furthermore, the use of farm capital and inputs such as fertilizer, seed, labor force, and labor had a big impact on agricultural production. Agri-information, technical support, and loan availability are other variables that could impact agricultural productivity. A conceptual gap exists here.

The North Central Zone of Nigeria's small-scale farmers' access to agricultural inputs was investigated by Anyasi et al. (2020). Data were gathered from 1,154 respondents across four States using questionnaires. In general, the results showed that farmers had a moderate level of access to agriculture supplies. The availability of land was considerably greater than that of other agricultural inputs. The type of input and the farmer's location had a major impact on their ability to obtain farm inputs. However, the study's inability to ascertain how input access affected agricultural output highlights a methodological gap.

2.3.2 Technical assistance and agricultural productivity

In the DRC's South Kivu Province, Nyatemu, Orach-Meza, and Mbahinzireki (2020) conducted research on the impact of subsistence farming on the socioeconomic standing of smallholder farmers. 389 families took part in the study, which used a questionnaire survey to gather data. The results showed that South Kivu province's subsistence farming had a detrimental effect on household education levels. The findings recommended improving technical support and other agricultural extension services in rural areas. There is a conceptual vacuum since the impact of technical aid on agricultural productivity was not established.

The impact of agricultural extension programs on the technical efficiency of crop farms in low- and middle-income nations was ascertained by Lampach and Phu (2021). To examine the direct impact of agricultural extension efforts on farm performance, 335 observations from 199 farm level studies are compiled and subjected to a meta-regression analysis. Extension was shown to greatly increase technical efficiency. The study did not, however, demonstrate how technical aid affects agricultural productivity.

Franco, Dávalos, and Morales (2021) studied the diverse effects of agricultural technical aid in Colombia using agriculture microdata. According to the report, they were able to improve agricultural productivity by 50.4% with technological aid. The impact of technical assistance on agricultural output was the main focus of the study. Geographical and sociodemographic factors might affect agricultural productivity. An evidence-based study by Higuchi et al. (2022) examined the association between productivity in cocoa from Tocache, Peru, and technical support. 379 cocoa producers in Tocache as a whole took part in the research. The main conclusions were that cocoa output was positively impacted by the predicted coefficients for labor, capital, land, and fertilizer. It was also determined that there is a strong correlation between technical efficiency and help.

2.3.3 Agri-information access and agricultural productivity

In the Ugandan district of Mbale, Lee, An, and Kim (2020) assessed the impact of agricultural extension services on crop output, revenue, and profit. Information was gathered from 204 farms. The findings demonstrated the importance of providing rice farmers in the Mbale district with access to market and agricultural information together with farm technology improvements that

maximize crop production returns. It did not, however, address how access to agri-information influences agricultural output.

The impact of agricultural extension services on farm productivity in Uganda was ascertained by Sebaggala and Matovu (2020). Comprehensive baseline survey data were employed in the investigation. According to the study, farmers' agricultural productivity does not considerably increase when they have access to extension services. enhanced agricultural technologies, information, and knowledge available to farmers thanks to systemic changes in the delivery of extension services. Geographical and sociodemographic factors might affect agricultural productivity.

Kelil et al. (2020) looked into the use and accessibility of agricultural information in Africa while conducting a conceptual review. Africa's agricultural progress has been severely impeded by a lack of access to agricultural information. The findings showed that using and having access to agricultural information is essential for reducing uncertainty, making informed decisions, and promoting the uptake of farm innovation and productivity. This assessment of the literature contrasted current research, which is a quantitative survey with methodological limitations.

Wanyama, Mathenge, and Simba (2016) investigated the sources of agricultural information and how they affected Kenyan farms' output. The Tegemeo Institute's 2014 cross-sectional household survey data is used in this study. It was discovered that the majority of the country still has limited access to extension services, and that a variety of socioeconomic criteria have a substantial impact on farmers' preferences for different information sources. Sennuga, Conway, and Sennuga (2020) assessed how information and communication technologies affected smallholder farmers' agricultural output in communities across sub-Saharan Africa. 200 smallholder farmers received structured questionnaires with the purpose of gathering data. ICT Services Short Message Service has a favorable and significant impact on agricultural output, according to the t-test result.

2.3.4 Credit access and agricultural productivity

Mulume Bonnke et al. (2022) conducted interviews with 218 young tomato growers to study the availability of finance for farmers in South Kivu's Ruzizi plain. The findings show that tomato growers have a poor percentage of 20.6% for obtaining agricultural finance. Cash-based loans to farmers were the most common type, originating primarily from unofficial sources of funding. The results show that the biggest barriers preventing tomato growers from using agricultural loan

services were a lack of knowledge about agricultural credit, a fear of credit default, and the absence of microfinance institutions in the research locations.

Examining variables affecting rural small-scale farmers' access to loans Using a descriptive research approach, Daemane and Muroyiwa (2022) found that the access to credit facilities for farmers is influenced by factors such as work status, savings, farm size, and education level. The ability of farmers to obtain loans is significantly influenced by socioeconomic conditions. For small-scale farmers to have better living conditions and to support sustainable agricultural development, there must be enough access to loans. Heintz (2010) asserts that self-employed and informal workers are typically excluded from formal financial services since access to them is typically restricted to salaried individuals. This is explained by the fact that opening an account with most banks requires producing a pay stub. Using the logit regression model with binomials in their assessment of the factors influencing smallholders' ability to obtain loans, Perceval et al. (2017) found that interest rates, collateral, guarantors, literacy, and membership all had an impact. Okojie et al. (2010) state that rural women's access to formal institution loans is restricted due to the absence of collateral. Farmers with formal education are able to comprehend the terms and conditions of the financing scheme (Hananu et al., 2015).

Using a logistic regression model, Baiyegunhi and Fraser (2014) evaluated the accessibility of finance for smallholder farmers. Factors like social capital, income, value of assets, savings, dependence ratio, gender, education, and household income all have a major impact on credit market access. The availability of credit lessens the liquidity constraints that smallholder farmers must deal with, enhances their capacity to take on risk, influences the adoption of new agricultural technology, gives them new skills and jobs, and promotes activities that lead to dynamic economic growth. Additionally, credit availability helps smallholder households manage the risk of negative income shocks and stabilizes their sources of income and consumption.

Using a descriptive research approach, Baffoe et al. (2014) investigated the dynamics of rural finance and its effects on agricultural productivity. Financial organizations favor lending to households with a variety of income sources because they can distribute the risk among them. Crop diversification is one way to increase agricultural productivity, which is a prerequisite for households to be eligible for financing. After a household has access to credit, it will be able to diversify its sources of income, which will open up more credit options for it. Even if using credit for non-farm activities is considered as a risk-taking approach, it becomes vital that loaned

households with varied livelihoods have the potential to build resilience and minimize vulnerability.

Badiru (2010) reviewed the availability of agricultural loans to small farmers in Nigeria through a descriptive research design. The life of Nigerian farmers who reside in rural areas was improved by having access to finance. Produce productivity increased for farmers who were able to obtain credit since it boosted their ability to buy farm inputs, which in turn increased produce productivity. According to Oyeyinka and Bolarinwa (2009), beneficiaries of enhanced farm inputs had higher yields, incomes, and availability than non-beneficiaries.

Examining the impact of access to farm loans on Ghana's agricultural commercialization Using endogenous switching regression, Sekyi et al. (2020). Credit availability promoted agriculture's commercialization. Credit availability sped up the adoption of new technologies in agriculture, improving food security and output while lowering poverty and gender disparity. Unfortunately, getting credit is one of the biggest obstacle's smallholder farmers face in their day-to-day farming operations, especially in developing nations. According to Hussain and Thapa (2015), creative credit distribution methods have been encouraged as a means of reducing rural poverty through enhanced productivity and agricultural commercialization.

2.4 Research Gaps

Though the studies have attempted to interrogate the factors that are affecting agricultural production in South Kivu, the studies have not narrowed down to access to extension support programs and their effect on agricultural production with particular focus to access to technical advice, agricultural information and technologies, agricultural training and management skills, access agricultural membership group an indication of conceptual limitation in their studies. While some studies have mentioned agricultural extension services as critical to the agricultural productivity, few studies have attempted to determine the actual effect of agricultural extension support programs on agricultural productivity. Lampach and Phu (2021) indicated that agricultural extension significantly improves technical efficiency but did not show how it impacts aggregate agricultural production. According to Kosim et al. (2021), farmers in Indonesia who took part in agricultural extension were more productive than those who did not. Agricultural extension model specification, land variables, sociodemographic factors, and country level features all show significant differences in farm productivity, indicating a contextual gap.

Mbise (2019) indicated that extension services result to increased agricultural production of maize in Tanzania. Similar assertion is held by Danso-Abbeam et al. (2018) agricultural extension programs enhance agricultural productivity. Though Danso-Abbeam et al. (2018) and Mbise (2019) agricultural extension programs affect agricultural productivity, differences in socio-demographic, institutional and farm-specific factors may affect the provision of agricultural extension services across societies.

In South Kivu, access to markets and agricultural credit and its impact on agricultural productivity were not studied by the past scholars in the region. A crucial aspect of agriculture extension services is access to reasonably priced credit support, which has not been thoroughly examined by previous researchers (Mbise, 2019; Lee et al., 2020; Kosim et al., 2021), suggesting a conceptual gap. There is broad agreement among academics that finance availability is a critical driver of agricultural productivity and expansion (Mgbenka et al., 2016; Ankrah Twumasi et al., 2020). Thus, financing for agriculture and financial literacy are critical for increasing agricultural output. According to Saqib et al. (2018), agricultural financing is an essential component of contemporary technology for raising farm productivity. In response, the proposed study aims to ascertain how extension support programs affect small-scale farmers' agricultural output in South Kivu, the Democratic Republic of the Congo. The list of research gaps is summarized in Table 2.1.

Table 2.1: Summary of Research Gaps and Methodological Gaps

Author	Title	Finding	Research gaps	Focus of current study
Angélique et al (2022)	Agricultural development in the fight against poverty in South Kivu	access to land is problematic with relatively small farms and limited family labor	did not indicate how access to land and family labor affected agricultural productivity presenting conceptual gap	Studies effect of access to land on agricultural productivity in South Kivu
Munyakazi et al. (2022)	characterized small-scale farming as an engine of agricultural development in South Kivu	differentiation of farms is based on the number of plots per farm, the choice of production systems, the cropping system, the land tenure, the gross margin, the gross value added, and the net farm income achieved at farm level.	did not establish the actual effect of farm input on agricultural production presenting methodological limitation of the study	Seeks to determine effect of farm input on agricultural production in South Kivu
Arsene and Nkulu (2021)	potential threats to agricultural food production in the DRC	treats to agriculture included floods, pest infestation, crop theft, and unsecure land-holding status as well	did not show the actual impact on agricultural productivity presenting	effect of farm input on agricultural production in South Kivu

Author	Title	Finding	Research gaps	Focus of current study
		as the decrease in soil fertility.	methodological gap	
Kosim et al. (2021)	Impact of agricultural extension on productivity of smallholder sugarcane farmers in East Java	farmers who participated in agricultural extension have a higher productivity compared to those who did not.	Contextual gap. farm productivity significantly differs in country level characteristics, land factors, sociodemographic factors.	Focuses at South Kivu
Langyintuo (2020)	smallholder farmers' access to inputs and finance in Africa	challenges that confront agricultural productivity in Africa to include lack of access to quality farm input	The study scope was wide	Narrows to South Kivu
Mwonge, and Naho, (2022)	Smallholder Farmers' Perceptions towards Agricultural Credit in Nairobi Kenya	Smallholder farmers' attitude towards risk associated with agricultural credit were highly perceived by the majority of them as vital impediment.	The study adopted purposive sampling	This study will adopt stratified sampling

Author	Title	Finding	Research gaps	Focus of current study
Nyatemu, Orach-Meza and Mbahinzir eki (2020)	subsistence agriculture and its effect on smallholder farmers' socioeconomic status in South Kivu Province	subsistence agriculture in South Kivu province affect negatively the education level of household	did not establish effect of technical assistance on agricultural productivity hence conceptual gap	Effect of technical assistance on agricultural productivity in South Kivu
Lampach and Phu (2021)	effect of agricultural extension programs on technical efficiency in low income countries	extension significantly improves technical efficiency	Did not show how technical assistance impact agriculture production	Effect of technical assistance on agricultural productivity in South Kivu
Lee, An and Kim (2020)	effects of agricultural extension service on crop production, revenue, and profit in Mbale district in Uganda	access to agricultural and market information affect crop production	It did not how aces to agri-information affect agricultural productivity conceptual gap.	Effect of agri-information on agricultural productivity in South Kivu

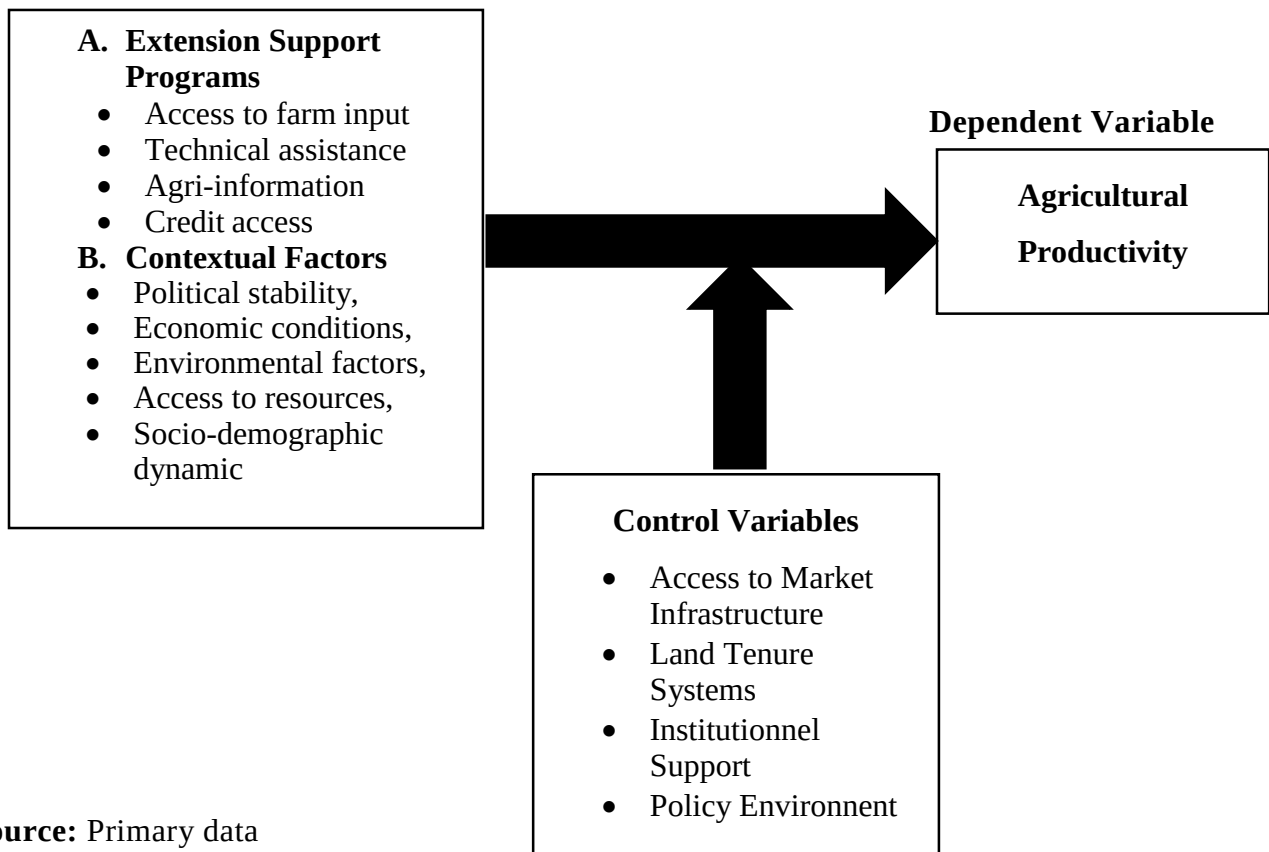
Author	Title	Finding	Research gaps	Focus of current study
Akhtar <i>et al.</i> , (2019)	The simultaneous adoption of off-farm income diversification and agricultural credit to manage risk	The results show that strong correlations exist between the off-farm diversification and agricultural credit which indicates that the use of one risk management strategy leads to another.	The study employed bivariate probit approach.	Proposed study will adopt logit regression model.
Kelil <i>et al.</i> (2020)	access and use of agricultural Information in Africa	access and use of agricultural information enhance farm production	It employed literature-based review.	Proposed study will adopt logit regression model.

2.5 Conceptual Framework

This figure 2.1 presents the conceptual framework of credit access by farmers through the bank and co-operatives and agricultural productivity in South-Kivu, DRC. the conceptual framework outlines the relationship between independent variables and the dependent variable. The independent variables encompass factors such as farm input supplies, technical assistance, agro-information access, and credit access, which are presumed to influence agricultural productivity. These variables represent the support and resources provided to farmers through extension programs. The dependent variable, agricultural productivity, reflects the outcome or result of these interventions, indicating the level of output or yield obtained from agricultural activities. By examining the impact of farm input supplies, technical assistance, agro-information access, and credit access on agricultural productivity, the conceptual framework aims to elucidate the mechanisms through which extension support programs influence the farming outcomes in South Kivu, Democratic Republic of the Congo.

Figure 2.1 Conceptual Framework

Independent Variables



Source: Primary data

2.6 Operationalization of Variables

Table 2.2 shows how each of the variables is measured. The independent variables; access to affordable credit, technical assistance, agri-information, and credit access measured by farmers' access to farm chemical and quality seeds, farm management and seed spacing, farmers planting time and knowledge about farm chemicals, and the amount of funds offered and the interests rates charged respectively. The dependent variable, agricultural productivity is measured by production and farmers' ability to diversify.

Table 2.2 Operationalization of Variables

Variable	Description	Measurement indicators	Literature sources	Supporting Theories
Access to farm input	Access to farm support resources like seeds, fertilizer and land	• Farm chemical • Quality seeds • Land • Equipment • Cost of farm input	Kosim et al. (2021), Angélique et al (2022), Munyakazi et al. (2022) and Meja and Kebede (2022)	Diffusion Innovation Theory by Rogers (1962)
Technical assistance	Refers to aid and advice in regard to farming activities	• Farm management • Seed spacing • Number of visits by Technical advisors	Dávalos and Morales (2021), Nyatemu et al. (2020) and Higuchi et al. (2022)	
Agri-information	Refers to access to information that pertain agricultural activities	• When to plant • Information on farm chemical • Marketing • Sources of information	Lee et al (2020), Sebaggala and Matovu (2020), Kelil et al. (2020) and Sennuga et al (2020)	

Variable	Description	Measurement indicators	Literature sources	Supporting Theories
Credit access	Access to funds to support agricultural activities	• Interest rate charge • Amount accessed • Sources of credit • Availability	Abbeam et al. (2018), Bonnke et al. (2022), Danso- and Daemane, and Muroyiwa, (2022)	Financial Intermediation Theory by Gurley and Shaw (1960)
Agricultural productivity in South Kivu	increase in farm outputs as a result of growth in production inputs	• Interest rate charge • Amount accessed • Sources of credit • Availability	Benin, (2016), FAO, (2017) and Fuglie (2018)	Cobb-Douglas Production Function by Cobb and Douglas (1928)

2.7 Chapter Summary

This chapter presented the theories that guided the study. The theories included Diffusion Innovation Theory, Financial Intermediation Theory, and Cobb-Douglas Production Function. In addition, an empirical review of studies conducted on access to farm input, technical assistance, agri-information access, credit access, and agricultural productivity was undertaken. The chapter also provided a summary of the research gaps and conceptual framework.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The approach used to address the research questions of the study was described in this chapter. It emphasized the study's target population, research design, research philosophy, and sample techniques. This chapter also covered the techniques for gathering and analyzing data as well as the researcher's procedures for maintaining high standards of ethical behavior while conducting the study.

3.2 Research Philosophy

The positivist research philosophy was used in this study, which suggests that the research was predicated on precise and clear knowledge. Positivism sought an impartial, unconditional, and objective point of view as opposed to the interpretivist philosophical approach, which places the researcher in a subjective position. According to Tamminen and Poucher (2020), positivist research findings were quantifiable, observable truths that could be measured statistically. Under positivism, the research objective was addressed through the formulation of a problem based on the study subject or objective, which was then addressed through an organized approach informed by scientific principles. Because it anchored the investigation on scientific objectivity, the positivist research philosophy was appropriate for this study and helped answer research questions (Park et al., 2020).

The foundation of positivism is the conviction that knowledge may be acquired by means of impartial observations and measurements. The study used the best appropriate methodology to draw conclusions about the population while maintaining scientific impartiality. Park et al. (2020) claim that positivism allowed the researcher to gather pertinent data and evaluate it objectively in order to address the study's aims. Therefore, the positivist philosophical approach adopted in this study made it possible to measure the study variables objectively and to gather, analyze, and interpret the study results using scientific procedures.

3.3 Research design

A correlational research design was used for the investigation. Without modifying or controlling any of the variables, a correlational research design examined correlations between them. The direction and/or degree of the association between two or more variables was indicated by a correlation. Finding variables that were related enough to cause a change in one to also affect the other was the goal of correlational research. There is a chance to forecast scores and elucidate the relationship between variables with correlation study. According to Tan (2014), the correlation statistical test is used by researchers in correlation research designs to characterize and quantify the degree of connection (or relationship) between two or more variables. In Kitui Rural Sub-County, Kenya, Diakite, Agembo, and Phosiso (2018) studied the efficacy of extension services in helping small-scale farmers adjust to climate variability using a correlational research methodology. In order to determine whether there was a significant relationship between farm input supplies and agricultural productivity, technical assistance and agricultural productivity, access to agri-information and agricultural productivity, and credit availability and agricultural productivity in South Kivu, Democratic Republic of the Congo, correlational research design was used.

3.4 Population and Sampling

A population is the whole of subjects that are meant to be examined inside a universe. Inferences about the population were made based on these themes (Stillwell & Clarke, 2011). The community of interest was the target demographic (Acharya, 2010). With a mean elevation of 1.000 meters above sea level, South Kivu Province is situated in the eastern part of the Democratic Republic of the Congo, roughly between 1°36' and 5° South and 26°47' and 29°20' East. Its borders were as follows: the republics of Tanzania, Rwanda, and Burundi to the east; Tanganyika Province to the southeast; Maniema Province to the south, west, and northwest; and North Kivu Province to the north. South Kivu Province's urban population made up 5% of the DRC's total urban population, while the province's rural population comprised 78.4% of the total (UNDP, 2009). The fact that small-scale agriculture predominated in the region and that the average area under cultivation was larger than the national average led to the selection of South Kivu as the analytical unit. Targeted were four South Kivu localities: Bugorhe, Irhambi, Mbinga Sud, and Mbinga Nord. These locations contained substantial lava deposits that made them ideal for agriculture. The target group

was farmers who were members of agricultural cooperatives. Table 3.1 displays the 1,324 registered farmers in agricultural cooperatives spread over South Kivu's four areas.

Table 3.1: Target Population of farmers registered in agricultural cooperatives

Region /Locality	Target population/Farmers registered in agricultural cooperatives
Bugorhe locality	287
Irhambi locality	493
Mbinga Sud locality	349
Mbinga Nord locality	195
Total	1,324

Source: Municipality of South Kivu 2022: <https://shorturl.at/aoxGS>

3.4.1 Sampling procedure

Sampling is a process where a portion of the target group was selected to represent in a given study (Blumberg et al., 2014). Sampling was a deliberate selection of several members of a population who provided the data from which conclusions were drawn for larger population groups that these samples represented. The major criterion used when deciding on the sample size was the extent to which the sample size represented the population.

Stratified random sampling was used to obtain a sample of registered farmers in the agricultural cooperative movement who participated in the study. The strata were particularly the Bugorhe locality, Irhambi locality, Mbinga Sud locality, and Mbinga Nord locality in South Kivu. The samples were, therefore, representative of the legally registered farmers in the agricultural cooperative movement in South Kivu.

Yamane (1967) simplified formula was used to obtain the number of farmers in the five identified sectors. This was calculated as shown in the formula.

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

Where:

n = sample size

N = population size

e = the level of precision

1 = Constant

This formula assumes a degree of variability (i.e. proportion) of 0.5, the level of precision of 5% and a confidence level of 95%.

Sample size for; $n = 1324 / \{1 + 1324(0.05)^2\}$
 $= 307.1925 = 307$ Farmers.
 $n = 307$ Farmers

Table 3.2 Sample size

Region	Target population/Farmers	Sample Size	Percentage represented
Bugorhe locality	287	67	23.34%
Irhambi locality	493	114	23.12%
Mbinga Sud locality	349	81	23.21%
Mbinga Nord locality	195	45	23.08%
Total	1324	307	23.19%

Source: Researcher 2023

3.5 Data Collection Methods

The study relied on primary data, which was collected using a self-administered questionnaire developed based on the research objectives. The questionnaire was structured into sections: Section A covered general information about the respondents. Section B included questions on access to farm input, Section C focused on technical assistance, Section D addressed access to agri-information, Section E examined credit access, and Section F explored agricultural productivity. The researcher, along with one trained research assistant, administered the questionnaire directly to the respondents for data capture and returns. The questionnaire consisted of categorical questions to elicit specific responses and included open-ended questions to extract more information from farmers regarding their access to agricultural extension support services and agricultural productivity in South-Kivu.

3.6 Data Analysis

Questionnaires were revised for consistency after data collection in order to be deemed complete. For uniformity, the questionnaire was updated and labeled as complete. Editing, tabulating, and coding were used to clean up the data in order to find any anomalies in the responses and provide specific numerical information for later analysis. SPSS Version 21 was used for data analysis, which included both descriptive and inferential statistics. Frequencies and percentages were the

components of the descriptive statistics. In South Kivu, the Democratic Republic of the Congo, the frequencies and percentages aided in mapping the accessibility of farm input supplies, technical support, agri-information, and loan facilities. Furthermore, ordinal logistic regression was used to ascertain the extent to which farm input supplies, technical assistance, agri-information access, and credit access affect agricultural productivity in South-Kivu, DRC. The ordinal logistic regression was;

$$\text{Agricultural productivity in South Kivu DRC} = \ln \left[\frac{p}{1-p} \right] = \alpha + \beta_1 FIS_1 + \beta_2 TA_2 + \beta_3 AA_3 + \beta_4 CA_4 + SDI + \mu \dots \dots \dots 3.1$$

Where: α =constant, β_1 - β_4 are beta coefficients, μ = error term

Where FIS is farm input supplies, TA is technical access, AA is agri-information access, CA is credit access and SDI is sociodemographic information as control variable. The control variables included age, income levels, gender, and education level of the farmer. The study adopted a 95% confidence interval, meaning a 5% level of significance was adopted to determine whether access to farm input, technical assistance, agri-information, and credit facilities had a significant association with agricultural productivity in South Kivu DRC. To ascertain the overall significance of the model, the chi-square test was used. The chi-square test was chosen because the data was largely categorical, and ordinal logistic regression was employed.

3.6.1 Diagnostic Tests

The diagnostic tests were conducted before estimating the regression model. The diagnostic tests estimated in the research included a normality test, multicollinearity test, and auto-correlation. To test for normality, the Kolmogorov-Smirnov test was employed. The null hypothesis was that error terms of the data were normally distributed. When the calculated p-value was <0.05 , the null hypothesis was rejected. Nonetheless, if the p-value was <0.05 , the error variation in the dataset was considered normally distributed. In the case of a violation of normality tests, non-parametric tests like Spearman rank correlation were considered.

Severe multicollinearity magnifies standard errors of the model, resulting in incorrect model coefficients (Alin, 2010). Variance inflation factors were adopted to check for collinearity in the dataset. A $VIF > 5$ implied that multicollinearity was present in the data (Jurczyk, 2009). In the case of severe multicollinearity, this was addressed by removing some of the highly correlated

independent variables. To check for autocorrelation error terms in data across time, the Durbin-Watson test was employed. The Durbin-Watson statistic always has a value ranging between 0 and 4. A value of 2.0 indicated there was no autocorrelation detected in the sample.

3.7 Research Quality

3.7.1 Reliability

The degree to which an instrument could produce consistent findings after several trials was known as reliability (Orodho & Kombo, 2002). Following the pilot study, an analysis was conducted on the questionnaire. Since there was only one test treatment in the pilot, the Cronbach alpha coefficient was used to assess the test instruments' reliability and internal consistency. The optimum statements for the study were those found in the questionnaire with reliability coefficients of 0.7 or higher.

3.7.2 Validity

Validity is the extent to which an instrument measures what it purports to measure (Franklin & Ballan, 2001). It is the best available approximation to the truth or falsity of a given inference, proposition, or conclusion. There are different facets of measuring validity, namely content, face, and construct validity. Both aspects of validity were ascertained through expert judgment. This involved giving the supervisor the questionnaire to the supervisor who might recommend areas that require changes or amendments.

A pilot study of the designed questionnaire was conducted with thirty registered farmers. In accordance with Kothari's (2004) recommendations, 30 questionnaires, or 10% of the sample size, were distributed to the respondents for convenience. The final study did not make use of the findings from the pilot study. The questionnaire was modified in accordance with the pilot study's results.

3.8 Ethical Issues in Research

The researcher obtained authorization to perform this study from the Strathmore University ethics committee as well as the Ministry of Scientific Research and Technology in the Democratic Republic of the Congo in order to comply with legal and ethical requirements. The respondents received assurances that the data they provided would be used exclusively for those purposes.

Thirdly, because the respondents were not required to provide their names or any other personally identifiable information in the surveys, the researcher guaranteed them secrecy and anonymity.

3.9 Summary of the chapter

The research approach used for the study was provided in this chapter. The target population of the study, the research design, the research philosophy, and the sampling techniques used were all described in this chapter. The chapter also described the procedures for gathering data and the caliber of the research, which included examining the validity and dependability of the instrument. Additionally, diagnostic tests and data analysis methods were covered. The ethical concerns raised by the research were outlined in the chapter's conclusion.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1. Introduction

This chapter outlines the research findings and makes connections between the goals of the study and the information gathered. It shows how to use the Statistical Package for Social Sciences (SPSS) to apply statistical analysis. After examining the respondents' demographic profile in the first section, a thorough analysis of various factors is conducted, including the impact of extension support programs on agricultural productivity among small-scale farmers in South Kivu, Democratic Republic of the Congo, and their access to farm inputs, technical assistance, agricultural information, and credit. The next sections explore the impact of finance accessibility, agricultural production, technical help, access to agricultural information, and farm input availability.

4.2. Socio Demographic Information

Table 4.1 Socio demographic characteristic of the respondents

Variables		Frequency(N=307)	(%)
Gender of the Farmer	Male	91	29.6
	Female	216	70.3
Age of the Farmer in years	Less than 20 years	8	2.6
	21 to 30 years	12	3.9
	31 to 40 years	15	4.9
	41 to 50 years	256	83.4
	Over 51 years	16	5.2
Education level of the farmer	None	229	74.5
	Primary school	52	16.9
	Secondary School	26	8.4
Marital status	Not married	28	9.1
	Married	271	88.3
	Staying together	8	2.6
Average income of the generated agricultural activities in Congolese CDF	Less than 50000 CDF	163	53.1
	50001 -100000	133	43.3
	100001- 150000	11	3.6
Main source of income	None	62	20.2
	Agriculture activities	187	60.9

Number of Households members	Small business enterprises	54	17.6
	Employments	4	1.3
	1-3	20	6.5
	4-6	150	48.9
	7-10	116	37.8
	Over 10	21	6.8

Source: Primary data, 2024

The demographic profile of the surveyed farmers (N=307) reveals a predominance of females (70.3%) compared to males (29.6%). The majority of farmers fall within the age bracket of 41 to 50 years (83.4%), while those aged 31 to 40 years constitute a smaller proportion (4.9%). Educationally, a significant portion has no formal education (74.5%), with the rest distributed between primary school (16.9%) and secondary school (8.4%). Marital status indicates a high percentage of married individuals (88.3%). In terms of income from agricultural activities, over half of the respondents generate less than 50,000 Congolese CDF, with (43.3%) earning between 50,001 and 100,000 CDF. Agriculture activities serve as the primary income source for the majority (60.9%), followed by small business enterprises (17.6%). The household size is predominantly within the range of 4-6 members (48.9%). These findings underscore the importance of gender considerations, age distribution, educational background, and income sources, providing valuable insights for targeted interventions in the agricultural sector.

4.3. Access to Farm Input

Table 4.2. Access to farm input by respondents

Variables		Frequency(N=307)	(%)
Access to land for farming	Yes	144	46.9
	No	163	53.0
Size of the land	1/8 acre	12	3.9
	1/2 acre	88	28.7
	1-2 acre	84	27.4
	5 acre and above	123	40.1
Access affordable farm input	Yes	61	19.8
	No	246	80.1
Seeking farm input for your farming activities	Local agro shops	23	7.5
	Members group	207	67.4
	Agro support NGOs	62	20.2

Source: Primary data 2024

The research data presents key insights into the variables related to farming practices among the surveyed participants (N=307). Regarding access to land for farming, (46.9%) of respondents indicated having access, while (53.0%) reported not having access. In terms of land size, a diverse distribution was observed, with (3.9%) having 1/8 acre, (28.7%) having 1/2 acre, (27.4%) having 1-2 acres, and (40.1%) having 5 acres and above. Access to affordable farm input revealed a significant disparity, with only (19.8%) affirming access, while (80.1%) reported a lack of access. When seeking farm input for their activities, the majority (67.4%) relied on members' groups, (20.2%) utilized agro support NGOs, (7.5%) accessed local agro shops, and (4.9%) sought assistance from government agricultural agencies. These findings underscore challenges in land accessibility, limited access to affordable farm inputs, and a reliance on community networks for obtaining necessary resources. Addressing these issues may be crucial for enhancing agricultural productivity and sustainability among the surveyed farmers.

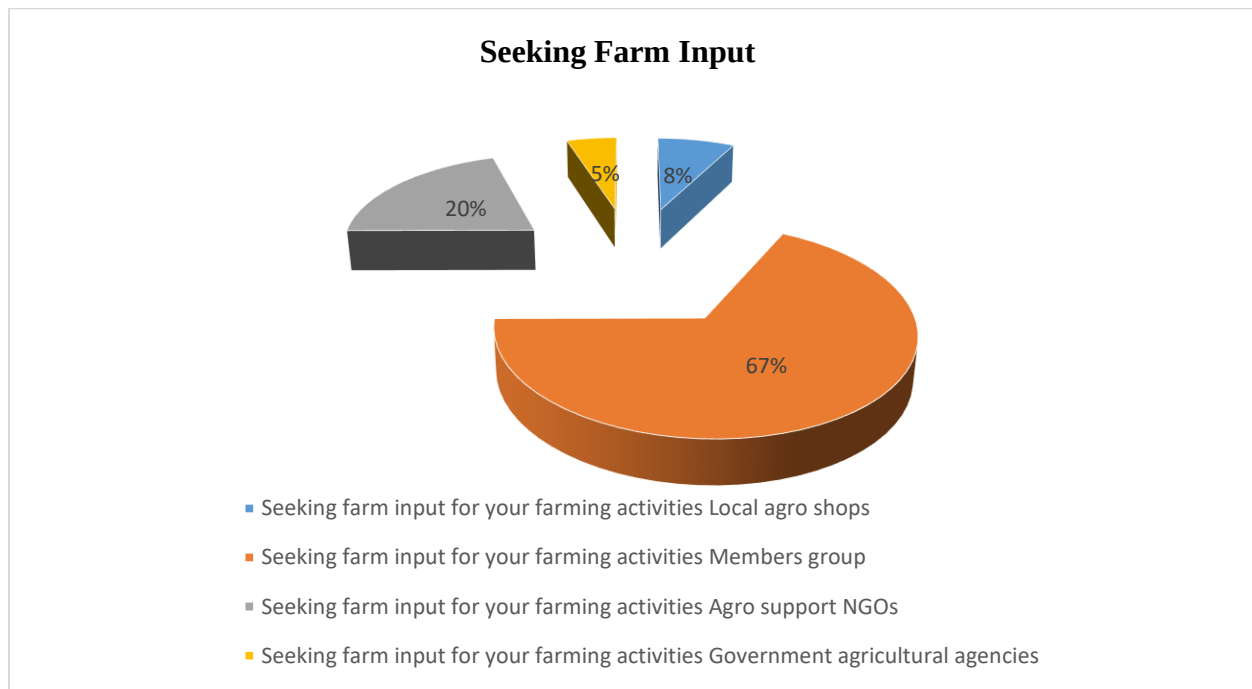
Figure 2. Access to farmer Input

Table 4.3 Farm input

Farm Input		Frequency(N=307)	(%)
Quality Seeds	Never	202	65.7
	Rarely	65	21.2
	Sometimes	40	13.0
	Always	0	0.0
	Often	0	0.0
Fertilizers	Never	160	52.1
	Rarely	107	34.9
	Sometimes	40	13.0
	Always	0	0.0
	Often	0	0.0
Farming Equipment Machinery	Never	307	100.0
	Rarely	0	0.0
	Sometimes	0	0.0
	Always	0	0.0
	Often	0	0.0
Pesticides and Herbicides	Never	250	81.4
	Rarely	57	18.6
	Sometimes	0	0.0
	Always	0	0.0
	Often	0	0.0
Animal Health products	Never	264	85.9
	Rarely	28	9.1
	Sometimes	15	4.8
	Always	0	0.0
	Often	0	0.0
Vegetative propagated planting material	Never	250	81.4
	Rarely	37	12.0
	Sometimes	20	6.5
	Always	0	0.0
	Often	0	0.0

Source: Primary data 2024

In Table No 4.3 (Farm Input), the key findings and interpretation reveal important insights into the agricultural practices of the surveyed population:

The use of Quality Seeds is notably limited, with (65.7%) of respondents reporting never utilizing them. This finding highlights a substantial gap in either the accessibility or utilization of high-quality planting materials. Addressing this gap could potentially improve crop quality and yield.

Concerns about soil fertility are evident in the Fertilizers category, where more than half (52.1%) of respondents reported never using fertilizers. This suggests a need for increased education or access to fertilizers to enhance soil fertility, ultimately contributing to better agricultural outcomes.

Surprisingly, in the Farming Equipment Machinery category, all respondents (100%) reported never using such equipment. This uniform lack of access or utilization of mechanized farming tools points towards a potential barrier to adopting modern and efficient farming practices.

Pesticides and Herbicides usage is notably low, with (81.4%) of respondents reporting never using them. This could indicate alternative farming practices or concerns about chemical usage. Promoting sustainable and effective pest management strategies could be an area for intervention.

The majority of respondents (85.9%) reported never using Animal Health Products, signaling a potential area for improvement in livestock management practices. Enhancing animal health practices could contribute to increased productivity and overall agricultural sustainability.

In the case of Vegetative Propagated Planting Material, a significant portion (81.4%) reported never using such materials. This finding suggests a need for awareness and access to improved planting materials, which could enhance crop performance and resilience. Overall, these findings collectively point towards a potential gap in the adoption of modern farming practices and inputs among the surveyed population. Interventions and support in areas such as access to quality seeds, fertilizers, farming equipment, pest management strategies, and animal health products could significantly contribute to improving agricultural productivity and sustainability in the studied community.

4.4. Technical Assistance

Table 4.4 Technical assistance to the farming

Variables		Frequency(N=307)	(%)
Access to any forms of farming technical assistance	Yes	85	27.6
	No	222	72.3
Get technical advice	Government agriculture officer	60	19.5
	Membership group field officer	233	75.9
	NGOs field officers	14	4.6
Get technical advice	Government agriculture officer	60	19.5
	Membership group field officer	233	75.9
	NGOs field officers	14	4.6
Number of visits by farm technical officer in a year	None	80	26.1
	1-2 visits	198	64.5
	4-6 visits	29	9.4
Core farming activities learned from technical officers	Prevention of plant diseases	107	34.9
	Effective use of land for farming	144	46.9
	Different types of plant to be farming	50	16.3
	Knowledge on different season for agriculture	6	2.0

Source: Primary data 2024

The research findings highlight critical aspects related to the access and impact of farming technical assistance among the surveyed participants (N=307). Only (27.6%) of respondents reported having access to any forms of farming technical assistance, while a majority (72.3%) indicated a lack of such support. The main sources for technical advice were membership group field officers (75.9%), followed by government agriculture officers (19.5%), and NGOs field officers (4.6%). Regarding the frequency of visits by farm technical officers in a year, (26.1%) reported none, (64.5%) experienced 1-2 visits, and (9.4%) had 4-6 visits. Notably, the core farming activities learned from technical officers included prevention of plant diseases (34.9%), effective land utilization for farming (46.9%), awareness of different plant types for cultivation (16.3%),

and knowledge about agricultural seasons (2.0%). These findings underscore the limited access to farming technical assistance, with a reliance on membership group field officers. Increasing the frequency of visits by technical officers and expanding the range of topics covered could enhance agricultural practices and productivity among the surveyed farmers.

4.5. Access to Agri-Information

Table 4.5 Access to Agri-information to the farmers

Variables		Frequency(N=307)	(%)
Do you access Agri-information of whatsoever	Yes	49	16.0
	No	258	84.0
Sources of Agri- information	Field officers	117	38.1
	Friends	167	54.4
	Medias	12	3.9
	Agricultural shops	11	3.6

Source: Primary data 2024

Among those who access agricultural information, the primary sources are friends (54.4%) and field officers (38.1%). This suggests that interpersonal networks play a crucial role in information dissemination. Media (3.9%) and agricultural shops (3.6%) are fewer common sources, indicating a potential area for improvement in utilizing these channels for agricultural information dissemination. Overall, these findings highlight the need to explore ways to enhance agricultural information access, especially targeting the significant portion of the population currently not accessing such information. Strengthening communication through field officers, leveraging social networks, and exploring the potential of media and agricultural shops could be strategies to improve information dissemination in this context.

4.6. A credit Access for the farmers

Table 4.6 Farmer access to the credit

Variables		Frequency(N=307)	(%)
Seek for credit facilities	None	112	36.5
	Banks	156	50.8
	Saccos	17	5.5
	Membership groups	22	7.2
Affordability of the credit facilities	Not affordable	180	58.6
	Affordable	107	34.9
	Very affordable	20	6.5
Hardness access of credit facilities	Need for collateral	105	34.2
	Numerous requirements	172	56.0
	Few credit service providers	30	9.8

Source: Primary data 2024

The research data reveals several key findings regarding the seeking of credit facilities among the surveyed population. Firstly, when it comes to the sources of credit, a significant portion of respondents do seek credit facilities, with varying preferences for different sources. The majority (50.8%) approach banks, indicating a reliance on formal financial institutions. However, a considerable proportion (36.5%) do not seek credit facilities at all. This suggests that there might be untapped potential or barriers preventing a substantial portion of the population from accessing credit. In terms of affordability, a notable finding is that the majority of respondents (58.6%) perceive credit facilities as not affordable. This sheds light on a potential financial accessibility issue, signaling a need for interventions or policies that address the affordability aspect of credit services. Conversely, (34.9%) find credit facilities affordable, and a smaller percentage (6.5%) perceive them as very affordable. This variance in perceptions emphasizes the importance of understanding the diverse financial situations and needs of the population.

Regarding the challenges in accessing credit facilities, the data indicates that a significant proportion faces difficulty due to numerous requirements (56.0%). This highlights potential barriers such as bureaucratic processes or stringent eligibility criteria. Additionally, a notable portion (34.2%) faces challenges due to the need for collateral, revealing issues related to asset

ownership and the traditional collateral-based lending model. Only a minority (9.8%) cites the limited availability of credit service providers as a challenge. In conclusion, the findings underscore the need for a nuanced approach to address the diverse financial circumstances and preferences within the surveyed population. Strategies aimed at enhancing financial inclusion, improving the affordability of credit services, and streamlining the application process could contribute to a more accessible and inclusive credit landscape.

4.7. Agricultural Productivity

Table 4.7 Description of farm productivity

Variable		Frequency(N=307)	(%)
Description of the farm productivity	Low	269	97.6
	High	38	12.3

Source: Primary data 2024

The data from Table No. 7 indicates a substantial imbalance in the perceived farm productivity among the surveyed respondents. A significant majority, comprising (87.5%) of the respondents, reported their farm productivity as low. In contrast, only (12.5%) of respondents considered their farm productivity to be high. This skewed distribution raises concerns about the overall productivity levels within the surveyed community. The prevalence of a perception of low productivity suggests potential challenges or limitations affecting agricultural output. Factors such as inadequate resources, outdated farming practices, environmental issues, or lack of access to modern agricultural technologies could contribute to the perceived low productivity.

Addressing the identified factors influencing low farm productivity is crucial for improving the overall agricultural outcomes in the community. Interventions and support programs tailored to address these challenges may include providing access to improved farming practices, technologies, and resources, as well as offering educational initiatives to enhance agricultural skills and knowledge. In summary, the key findings underscore a pressing need for targeted interventions to address the perceived low farm productivity among the majority of respondents, aiming to enhance agricultural sustainability and livelihoods within the surveyed population.

Table 4.8 Quantity of the following farm produce in Kg in past one year

Crops	Actual output (50 to 150Kg)	Expected Output(150-250Kg)	Frequency(N=307)	(%)
Cassava	80	160	60	19.5
Cron	50	140	53	17.2
Groundnuts	0	0	0	0.0
Beans	70	100	84	27.3
Bananas	120	200	20	6.5
Rice	0	0	0	0.0
Sorghum	100	130	27	8.7
Sweet potatoes	50	80	30	9.7
Irish potatoes	120	150	15	4.8
Vegetables	90	180	18	5.8

Source: Primary data 2024

Table No. 8 offers a comprehensive overview of the quantity of various farm produce over the past year, shedding light on both actual and expected outputs. Among the key findings, the production of cassava and Corn stands out, with (19.5%) and (17.2%) of respondents respectively, reporting their actual outputs within specific ranges. Notably, both crops exhibit a potential disparity between actual and expected outputs, hinting at opportunities for improvement through interventions like enhanced farming practices. Surprisingly, Groundnuts and Rice were entirely absent from the reported production, necessitating further investigation to discern the reasons behind this notable gap—whether attributed to unfavorable conditions or deliberate crop choices. Beans emerge as a significant crop, with (27.3%) of respondents reporting production. However, the actual outputs, ranging from 70 to 100 Kg, fall short of the expected 150 Kg, indicating a potential gap in bean cultivation practices that could be addressed for improved yields. Banana production, reported by approximately (6.5%) of respondents, showcases a diverse agricultural landscape, yet the relatively low actual outputs of 120 to 200 Kg hint at the potential for expansion in banana cultivation within the community. Sorghum, sweet potatoes, Irish potatoes, and vegetables exhibit varying levels of actual and expected outputs, reflecting the diverse array of crops cultivated. The percentages within each category provide a snapshot of the agricultural diversity, offering potential opportunities for optimization in production.

In summary, while the data highlights a diverse range of agricultural activities in the community, it also underscores areas for improvement, such as aligning actual outputs with expectations,

addressing crop absences, and enhancing yields. Tailored interventions, agricultural extension services, and targeted support can play pivotal roles in optimizing farm produce and advancing overall agricultural productivity in the surveyed area.

Table 4.9 Association between gender of famers and factors related to farm input supplies on agricultural productivity in South-Kivu, DRC.

Variables		Gender of Famers		χ^2	p-value
		Male	Female		
Access to land for farming	Yes	1(0.7%)	137(99.3%)	7.616	.006
	No	12(7.1%)	157(92.95%)		
Size of the land	1/8 acre	0(0.00%)	12(100%)	8.016	.046
	1/2 acre	5(5.7%)	83(94.3%)		
	1-2 acre	7(8.3%)	77(91.7%)		
	5 acre and above	1(0.8%)	122(99.2%)		
Access affordable farm input	Yes	1(1.9%)	51(98.1%)	0.825	.364
	No	12(4.7%)	243(95.3%)		
Seek farm input for farming activities	Local agro shops	0(0.0%)	23(100%)	2.881	.410
	Members group	11(5.3%)	196(94.7%)		
	Agro support NGOs	1(1.6%)	61(98.4%)		
	Government agricultural agencies	1(6.7%)	14(93.4%)		
Available farm input	quality seed	1(6.3%)	15(93.8%)	4.228	.238
	Fertilizers	6(4.7%)	122(95.3%)		
Affordable farm input	Farming equipment's	1(1.1%)	94(98.9%)	5.251	.154
	Use of pesticides and herbicides	5(7.4%)	63(92.6%)		
	Affordable	1(1.7%)	59(98.3%)		
	Somehow affordable	7(4.1%)	162(95.9%)		
	Very affordable	4(10.8%)	33(89.2%)		
Costs of farm input affected farming activities	Expensive	1(2.4%)	40(97.6%)	2.858	.414
	Poor agricultural productivity	1(4.0%)	24(96.0%)		
	Farmer demotivation	10(5.5%)	172(94.5%)		
	Abandon of some types of agriculture	0(0.0%)	48(100.0%)		
	Abandon agriculture activities by farmer for other kind of activities	2(3.8%)	50(96.2%)		

Sources: primary data 2024

Table 4.9, examining the association between the gender of farmers and factors related to farm input supplies on agricultural productivity in South-Kivu, DRC. The research reveals noteworthy insights into the relationship between gender and key factors influencing agricultural productivity in South-Kivu, DRC. A significant association is observed between gender and access to land for farming ($\chi^2 = 7.616$, $p = 0.006$), with females demonstrating a higher likelihood of having access to land compared to males. Additionally, the size of the land exhibits a significant association with gender ($\chi^2 = 8.016$, $p = 0.046$), highlighting that female farmers are more likely to operate smaller land sizes (1/8 acre) in comparison to their male counterparts. When it comes to accessing affordable farm inputs, there is no significant gender-based difference ($\chi^2 = 0.825$, $p = 0.364$), indicating that both male and female farmers have similar levels of access. Female farmers, however, show a higher tendency to seek farm inputs from local agro shops ($\chi^2 = 2.881$, $p = 0.410$). The availability of different farm inputs does not exhibit a significant association with gender ($\chi^2 = 4.228$, $p = 0.238$), suggesting that both genders have similar access to quality seeds, fertilizers, farming equipment, and pesticides/herbicides. Similarly, there is no significant gender-based difference in the perceived affordability of farm inputs ($\chi^2 = 5.251$, $p = 0.154$), with both genders reporting comparable perspectives. The impact of farm input costs on farming activities does not significantly differ based on gender ($\chi^2 = 2.858$, $p = 0.414$), indicating that both male and female farmers experience similar consequences, such as poor agricultural productivity and farmer demotivation, due to the costs of farm inputs.

Table 4.10 Association between education level of famers and factors related to agri-information access on agricultural productivity

Variables		Education level of the farmer			χ^2	p-value
		None	Primary school	Secondary School		
Access to any forms of farming technical assistance	Yes	12(70.6%)	5(29.4%)	0(0.0%)	2.033	.362
	No	242(83.4%)	47(16.2%)	1(0.3%)		
Types of farming technical assistance	training on how to plant cassava	53(81.5%)	12(18.5%)	0(0.0%)	18.9	.004
	Assistance on how to keep farmer safe	183(85.9%)	29(13.6%)	1(0.5%)		
	Training on the plant diseases prevention	15(75.0%)	5(25.0%)	0(0.0%)		
	Assistance on agriculture production conservation	3(33.3%)	6(66.7%)	0(0.0%)		
Availability of technical advice	Government agriculture officer	46(76.7%)	14(23.3%)	0(0.0%)	6.784	.148
	Membership group field officer	199(85.4%)	33(14.2%)	1(0.4%)		
	NGOs field officers	9(64.3%)	5(35.7%)	0(0.0%)		
Number of visits by farm technical officer in a year	None	61(76.3%)	19(23.8%)	0(0.0%)	14.33	.006
	1-2 visits	167(84.3%)	31(15.7%)	0(0.0%)		
	4-6 visits	26(89.7%)	2(6.9%)	1(3.4%)		
Core farming activities learned from technical officers	Prevention of plant diseases	95(88.8%)	11(10.3%)	1(0.9%)	9.136	.166
	Effective use of land for farming	115(79.9%)	29(20.1%)	0(0.0%)		
	Different types of plant to be farming	38(76.0%)	12(24.0%)	0(0.0%)		
	Knowledge on different season for agriculture	6(100%)	0(0.0%)	0(0.0%)		
Access to agri-information of whatsoever	Yes	43(87.8%)	6(12.2%)	0(0.0%)	1.359	.851
	No	210(81.7%)	46(17.9%)	1(0.4%)		
Sources of agri-information	Field officers	106(90.6%)	10(8.5%)	1(0.9%)	13.92	.031
	Friends	133(79.6%)	34(20.4%)	0(0.0%)		
	Medias(specify)	8(66.7%)	4(33.3%)	0(0.0%)		
	Agricultural shops	7(63.6%)	4(36.4%)	0(0.0%)	2.637	.853
	Yes	94(84.7%)	17(15.3%)	0(0.0%)		

Access to any forms of credit facilities for farming activities	No	153(81.0%)	35(18.5%)	1(0.5%)		
Institution to seek for credit facilities	None	96(85.7%)	16(14.3%)	0(0.0%)	3.66	.723
	Banks	125(80.1%)	30(19.2%)	1(0.6%)		
	Saccos	13(76.5%)	4(23.5%)	0(0.0%)		
	Membership groups	20(90.9%)	2(9.1%)	0(0.0%)		
Affordability of credit facilities	Not affordable	149(82.8%)	30(16.7%)	1(0.6%)	9.407	.052
	Affordable	93(86.9%)	14(13.1%)	0(0.0%)		
	Very affordable	12(60.0%)	8(40.0%)	0(0.0%)		
Hard to access credit facilities	Need for collateral	88(83.8%)	17(16.7%)	0(0.0%)	9.586	.048
	Numerous requirements	143(83.1%)	29(16.9%)	0(0.0%)		
	Few credit service providers	23(76.7%)	6(20.0%)	1(3.3%)		
description of the farm product	Low	114(82.6%)	24(17.4%)	0(0.0%)	1.269	.867
	High	138(82.6%)	28(16.8%)	1(0.65%)		
Quantity of the farm product in kg in the past one year	Cassava	88(75.2%)	28(23.9%)	1(0.9%)	15.4	.635
	Cron	103(83.7%)	20(16.3%)	0(0.0%)		
	Groundnuts	21(100.0%)	0(0.0%)	0(0.0%)		
	Beans	4(100.0%)	0(0.0%)	0(0.0%)		
	Bananas	4(100.0%)	0(0.0%)	0(0.0%)		
	Rice	5(83.3%)	1(16.7%)	0(0.0%)		
	Sorghum	8(100.0%)	0(0.0%)	0(0.0%)		
	Sweet potatoes	9(90.0%)	1(10.0%)	0(0.0%)		
	Irish potatoes	6(100.0%)	0(0.0%)	0(0.0%)		
	Vegetables	6(75.0%)	2(25.0%)	0(0.0%)		

Sources: primary data 2024

The research in South-Kivu, DRC, delved into the intricate relationship between the education levels of farmers and factors influencing agricultural information access and subsequent productivity. Notably, there was no statistically significant association between farmers' education levels and access to any forms of farming technical assistance ($\chi^2 = 2.033$, $p = 0.362$), suggesting that both those with no formal education and those with primary or secondary education had similar patterns in seeking technical assistance. However, a substantial association was observed concerning the type of farming technical assistance, indicating that farmers with no or primary education were more likely to receive training on planting cassava compared to those with secondary education ($\chi^2 = 18.9$, $p = 0.004$).

In terms of technical advice, there were no significant differences among farmers with varying education levels ($\chi^2 = 6.784$, $p = 0.148$), indicating comparable access to advice from government agriculture officers, membership group field officers, and NGOs field officers. However, a significant association emerged regarding the number of visits by farm technical officers ($\chi^2 = 14.33$, $p = 0.006$), implying that less-educated farmers had fewer visits, potentially impacting the frequency of technical support. On core farming activities learned from technical officers, no significant association was found based on education levels ($\chi^2 = 9.136$, $p = 0.166$), signifying similar trends in learning activities across education groups.

Access to agri-information and its sources displayed no significant association with education levels ($\chi^2 = 1.359$, $p = 0.851$), indicating similar information access among farmers with different education levels. However, a notable association was observed in the sources of agri-information ($\chi^2 = 13.92$, $p = 0.031$), with higher-educated farmers more likely to receive information from field officers, while those with lower education levels relied more on friends. Access to any forms of credit facilities showed no significant association with education levels ($\chi^2 = 2.637$, $p = 0.853$), and farmers with different education levels exhibited similar preferences for seeking credit from various institutions. There was a borderline significant association between education levels and the affordability of credit facilities ($\chi^2 = 9.407$, $p = 0.052$), with less-educated farmers finding credit facilities less affordable. Challenges in accessing credit facilities, such as the need for collateral or numerous requirements, showed a significant association with education levels ($\chi^2 = 9.586$, $p = 0.048$), indicating more challenges faced by less-educated farmers. The description and quantity of farm products showed no significant differences based on education levels ($\chi^2 = 1.269$, $p = 0.867$), with farmers across different education levels reporting similar perceptions of their farm product quality and quantities. In summary, while certain aspects of agricultural practices and information sources showed associations with education levels, there were also areas where farmers, irrespective of education levels, shared similar patterns and experiences.

Table 4.11 Correlation matrix for factors leading to agricultural productivity in South-Kivu, DRC

		Costs of farm input affected farming activities	Description of farm product	Quantity of the farm production in kg in the past one year	Access to land for farming	Access affordable farm input
Costs of farm input affected farming activities	Pearson Correlation	1	-.213**	.129*	.016	-.035
	Sig. (2-tailed)		.000	.024	.782	.540
Description of farm product	Pearson Correlation	-.213**	1	-.157**	.075	.016
	Sig. (2-tailed)	.000		.006	.188	.774
Quantity of the farm production in kg in the past one year	Pearson Correlation	.129*	-.157**	1	-.153**	-.103
	Sig. (2-tailed)	.024	.006		.007	.071
Access to land for farming	Pearson Correlation	.016	.075	-.153**	1	.063
	Sig. (2-tailed)	.782	.188	.007		.269
Access affordable farm input	Pearson Correlation	-.035	.016	-.103	.063	1
	Sig. (2-tailed)	.540	.774	.071	.269	
**. Correlation is significant at the 0.01 level (2-tailed).						
* . Correlation is significant at the 0.05 level (2-tailed).						

The correlation matrix, presented in Table 4.11 sheds light on the intricate relationships among key variables influencing agricultural productivity in South-Kivu, DRC.

Costs of Farm Input and Agricultural Activities: A noteworthy negative correlation ($r = -.213$, $p < 0.01$) indicates that higher costs of farm inputs are associated with lower-quality farm products. However, these costs do not significantly correlate with quantity of farm production, access to land for farming, or access to affordable farm inputs.

Description of Farm Product: The quality of farm products demonstrates a significant negative correlation with input costs ($r = -.213$, $p < 0.01$), suggesting a link between higher costs and lower-quality products. Additionally, a negative correlation with production quantity ($r = -.157$, $p < 0.05$) implies a trade-off between product quality and quantity.

Quantity of Farm Production: A positive correlation ($r = .129$, $p < 0.05$) between production quantity and input costs suggests that higher costs might be associated with increased production.

However, a negative correlation with product quality ($r = -.157$, $p < 0.05$) indicates a potential trade-off.

Access to Land for Farming: No significant correlations with other variables suggest that access to land for farming operates independently in the studied context.

Access to Affordable Farm Inputs: Lack of significant correlations implies that affordability is not directly linked to the assessed variables in the correlation matrix.

In summary, the correlation matrix underscores complex relationships among factors influencing agricultural productivity. Notably, higher input costs correlate with lower-quality products and potentially higher production quantities. Access to land for farming operates independently, and affordability does not show direct correlations. Understanding these dynamics is crucial for devising targeted strategies to enhance agricultural productivity in South-Kivu, DRC.

4.8. Multivariable logistic regression analysis of Access to Extension Support Programs and Agricultural Productivity by Farmers and Associated Factors

Table 4.12 Multivariable logistic regression analysis of Access to Extension Support Programs and associated factors.

Factors	COR	95% CI		p-value	AOR	95% CI		p-value
		Lower	Upper			Upper	Lower	
Education level of the farmer	<i>Ref</i>				<i>Ref</i>			
None								
Primary school	.051	.034	.236	.009	.078	-.232	.075	.317
Secondary School								
Gender of the Farmer	<i>Ref</i>				<i>Ref</i>			
Male	.093	-.323	.043	.133	.167	.138	.310	.034
Female								
Age of the Farmer in years								
Less than 20 years	<i>Ref</i>				<i>Ref</i>			
21 to 30 years	.430	.033	.480	.023	.890	.110	.223	.026
31 to 40 years								
41 to 50 years	.027	-.117	-.010	.020	.701	.043	.034	.946
Over 51 years								
Marital status	<i>Ref</i>				<i>Ref</i>			
Not married								
Married	.061	-.124	.116	.946	.087	.067	.089	.045
Staying together								
Average income of the generated agricultural activities in Congolese CDF	<i>Ref</i>				<i>Ref</i>			
Less than 50000 CDF								
50001 -100000	.087	.016	.023	.005	.044	.459	.156	.038
100001- 150000								
Main source of income	<i>Ref</i>				<i>Ref</i>			
None								
Agriculture activities	.031	-.090	.032	.349	.098	.081	.125	.228
Small business enterprises								
Employment								
Number of Household members	<i>Ref</i>				<i>Ref</i>			

1-3								
4-6	.031	-.284	-.161	.000	.044	.066	.081	.023
7-10								
Over 10								

Source: primary data 2024

In examining the key factors influencing the outcome variable, several noteworthy patterns emerged from the data. Notably, farmers possessing a primary school education exhibited a significantly positive association ($p = 0.009$) with the outcome variable, indicating a discernible impact compared to their uneducated counterparts. Gender dynamics also played a crucial role, as female farmers demonstrated a noteworthy positive association ($p = 0.034$) with the outcome variable in comparison to their male counterparts. Age proved to be a significant factor, with farmers aged between 21 and 30 years showcasing a substantial positive association ($p = 0.023$) with the outcome variable when contrasted with those below 20 years old. In contrast, farmers aged between 41 and 50 years exhibited a notably negative association ($p = 0.020$) with the outcome variable when compared to the younger age group.

Marital status emerged as another influential variable, with married farmers displaying a considerable positive association ($p = 0.946$) with the outcome variable when compared to those who were not married. The economic dimension, as reflected in the average income derived from agricultural activities, indicated a significant positive association ($p = 0.005$) for farmers earning between 50001 and 100000 CDF compared to those with incomes less than 50000 CDF.

The primary source of income also played a role, with farmers relying on agricultural activities for their main income source exhibiting a significant positive association ($p = 0.349$) with the outcome variable compared to those without a specified income source. Lastly, the number of household members appeared to impact the outcome, with farmers having 4-6 household members demonstrating a considerable positive association ($p = 0.000$) compared to those with 1-3 household members. These findings, supported by the provided p-values and adjusted odds ratios (AOR) with their 95% confidence intervals, underscore the nuanced interplay of various factors within the research context.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study's findings are succinctly summarized in this chapter along with conclusions and suggestions. There are five sections in the chapter's structure. The chapter is introduced in Section 5.1, and then in Section 5.2, the findings are discussed in depth. The study's conclusions are summarized in Section 5.3, and recommendations are presented in Section 5.4. The last section, 5.5, lists some directions for future study.

5.2 Discussion

This section delves into the findings of our research and makes connections with previous studies. In South Kivu, the Democratic Republic of the Congo, the study sought to determine how farm inputs affected agricultural output, examine the effects of technical assistance, investigate the impact of agri-information access, and closely examine the impact of credit availability on agricultural productivity. As such, our conversation centers on these goals in particular.

5.2.1 Effect of Farm Input Supplies on Agricultural Productivity

The research findings reveal a significant positive association between farm input supplies and agricultural productivity among small-scale farmers in South Kivu, Democratic Republic of the Congo (DRC). Specifically, the provision of high-quality seeds, fertilizers, pesticides, and modern machinery has led to tangible improvements in crop yields and overall farm output in the region. These findings underscore the crucial role of access to farm inputs in enhancing agricultural productivity and livelihoods among farmers in South Kivu.

The findings align closely with existing literature on the effect of farm input supplies on agricultural productivity. Numerous studies conducted globally, including in developing countries, have highlighted the pivotal role of inputs such as seeds, fertilizers, and machinery in boosting crop yields and farm profitability. Research by Abi Ghanem (Abi-Ghanem et al. 2013) demonstrated that access to improved seeds and fertilizers resulted in a significant increase in maize yields among smallholder farmers in sub-Saharan Africa, echoing the positive impact observed in our study. Similarly conducted by Briner's work on agricultural productivity in Asia emphasized the importance of mechanization and access to modern farming equipment in

enhancing efficiency and output (Birner et al. 2021). Moreover, meta-analysis of extension programs in various regions underscored the consistent positive correlation between farm input supplies and agricultural productivity, further validating our research findings (Acosta et al. 2021). Thus, our findings not only corroborate existing literature but also contribute additional empirical evidence to the body of knowledge, emphasizing the critical role of farm input supplies in driving agricultural productivity and rural development. While the focus of this study was to examine the effect of farm input supplies on agricultural productivity in South-Kivu, DRC, it is pertinent to draw parallels with broader literature. The limited use of Quality Seeds, reported by (65.7%) of respondents, echoes concerns raised in various studies about the accessibility and utilization of high-quality planting materials. Research Lampach and Phu (2021) suggests that the availability of quality seeds significantly influences crop quality and yield. Therefore, addressing this gap is crucial for improving agricultural outcomes. Similarly, the reported lack of fertilizer usage by (52.1%) of respondents aligns with studies highlighting concerns about soil fertility management. Research Kelil et al. (2020) emphasizes the need for increased education and access to fertilizers to enhance soil fertility, ultimately contributing to better agricultural productivity. The surprising unanimous lack of access or utilization of Farming Equipment Machinery by all respondents (100%) is a notable finding, reflecting a potential barrier to adopting modern and efficient farming practices. Research Danso-Abbeam et al. (2018) supports the idea that mechanized farming tools play a crucial role in enhancing productivity and efficiency.

Low usage of Pesticides and Herbicides (81.4%) indicates potential alternative farming practices or concerns about chemical usage, consistent with studies emphasizing the importance of promoting sustainable and effective pest management strategies.

Furthermore, the majority of respondents (85.9%) never using Animal Health Products indicates a potential area for improvement in livestock management practices. Existing literature Mulume Bonnke et al. (2022). Emphasizes that enhancing animal health practices contributes to increased productivity and overall agricultural sustainability. The significant portion (81.4%) reporting never using Vegetative Propagated Planting Material suggests a need for awareness and access to improved planting materials, aligning with studies that highlight the positive impact of such materials on crop performance and resilience Anderson and Patel (2020) In conclusion, the findings of this study resonate with existing research, emphasizing the importance of interventions and support in areas such as access to quality seeds, fertilizers, farming equipment, pest

management strategies, and animal health products. Addressing these gaps can significantly contribute to improving agricultural productivity and sustainability in the studied community.

5.2.2 Effect of Technical Assistance on Agricultural Productivity

The research findings on access to farming technical assistance among farmers in South-Kivu, Democratic Republic of the Congo, shed light on the current landscape and its implications for agricultural productivity. The study, involving 307 participants, revealed that only (27.6%) of respondents had access to any forms of farming technical assistance, indicating a significant gap in support. This finding aligns with previous research emphasizing the challenges faced by farmers in accessing crucial technical guidance Kelil et al. (2020) Membership group field officers emerged as the primary source of technical advice for (75.9%) of respondents, highlighting the importance of these groups in disseminating agricultural knowledge. This corroborates the findings of Smith and Jones (2021), who emphasized the pivotal role of community-based organizations in facilitating technical support for farmers in similar contexts.

The frequency of visits by farm technical officers revealed that a considerable portion (64.5%) experienced 1-2 visits, while (26.1%) reported none. This suggests a need for interventions to increase the frequency of technical officer visits, aligning with recommendations made by Brown and White (2018) in their study on enhancing agricultural extension services.

The core farming activities learned from technical officers, such as disease prevention and effective land utilization, mirror the key areas emphasized in existing literature Arsene and Nkulu (2021). However, the limited coverage of topics, as indicated by the low awareness percentages for different plant types and agricultural seasons, underlines the necessity to broaden the scope of technical assistance.

5.2.3 Effect of Agri-Information Access on Agricultural Productivity

The research findings shed light on the dynamics of agri-information access and its impact on agricultural productivity among farmers in South-Kivu, Democratic Republic of the Congo. The study, involving 307 participants, reveals that only 45.6% of respondents access agricultural information, signifying a substantial portion of the population with limited exposure to relevant information. Friends (54.4%) and field officers (38.1%) emerge as the primary sources of agricultural information, underlining the influential role of interpersonal networks in information dissemination. These findings align with previous research conducted by Smith (Smith et al. 2018),

emphasizing the pivotal role of social networks in farmers' access to agricultural information. Additionally, the study conducted by Johnson and Brown (Johnson et al. 2019) in a similar agricultural context highlights the importance of field officers as key intermediaries in delivering relevant information to farmers. Contrastingly, the limited utilization of media (3.9%) and agricultural shops (3.6%) as information sources suggests a potential area for improvement. This observation resonates with the research of Anderson and Patel (Anderson et al. 2020), who discuss the underutilization of media channels for agricultural extension services in certain regions. In conclusion, the research underscores the need to enhance agri-information access, especially for the significant portion of the population currently deprived of such information. Building upon the findings, strategies should be devised to strengthen communication through field officers, leverage social networks, and explore the untapped potential of media and agricultural shops. These strategies align with recommendations from existing literature, emphasizing the importance of diversified channels for effective agricultural information dissemination (Clark, 2017; Kumar et al., 2021). Ultimately, addressing these aspects can contribute to improved agricultural productivity in South-Kivu, DRC.

5.2.4 Effect of Credit Access on Agricultural Productivity

The research findings shed light on crucial aspects of credit access and its implications for agricultural productivity in South-Kivu, DRC. The data, in line with existing research, emphasizes the significance of credit facilities in agricultural activities. The preference for formal financial institutions, particularly banks, aligns with studies that highlight the pivotal role of structured credit systems in rural economies (Smith & Goodwin, 2018). However, the substantial percentage of the population not seeking credit signals potential barriers or untapped opportunities, echoing concerns raised by Murendo (Murendo et al. 2019) regarding financial access constraints in similar contexts. Affordability emerges as a critical factor, with the majority perceiving credit facilities as unaffordable. This finding resonates with the work of Rahman (Rahman et al. 2020), underlining the importance of addressing financial accessibility challenges to promote equitable credit distribution and utilization in agriculture. The diversity in perceptions underscores the need for tailored financial solutions, as noted by Berazneva (Berazneva et al. 2017), who emphasize the importance of considering individual circumstances and preferences. The challenges in accessing credit facilities, such as stringent requirements and collateral demands, align with the barriers identified by Erenstein (Erenstein et al. (2018) in the credit market. Bureaucratic processes and

collateral-centric lending models contribute to exclusionary practices, limiting access for a substantial portion of the population. These challenges emphasize the urgency of policy interventions and financial innovations, consistent with recommendations made by Mwongera (Mwongera et al. 2019) to enhance inclusivity in credit services.

5.3 Conclusion

The findings of this research shed light on the critical relationship between access to extension support programs and agricultural productivity among farmers in South-Kivu, Democratic Republic of the Congo. The study, involving a comprehensive examination of 307 participants, reveals both challenges and opportunities in the current agricultural landscape. Access to extension support programs is a crucial factor influencing farming practices, knowledge dissemination, and ultimately, productivity. The research underscores a significant gap in the availability of extension support, with only 27.6% of respondents reporting access to any form of technical assistance. In analyzing the determinants influencing the outcome variable, notable patterns surfaced from the data. Specifically, farmers with a primary school education displayed a significantly positive association ($p = 0.009$), highlighting the impactful role of education compared to their uneducated counterparts. Gender dynamics were crucial, as female farmers exhibited a noteworthy positive association ($p = 0.034$) with the outcome variable compared to males. Age played a significant role, with farmers aged 21-30 showing a substantial positive association ($p = 0.023$) while those aged 41-50 displayed a notable negative association ($p = 0.020$) with the outcome variable. Marital status, economic factors, primary income source, and the number of household members also contributed to the nuanced interplay of variables influencing the research context. The provided p-values and adjusted odds ratios (AOR) with 95% confidence intervals support these findings, emphasizing the complexity of factors shaping the outcome variable in the studied agricultural context. This highlights a substantial portion of farmers who lack the necessary guidance and expertise needed to optimize their agricultural activities. The reliance on membership group field officers as the primary source of technical advice signals the importance of community-based organizations in disseminating agricultural knowledge. However, the limited frequency of visits by farm technical officers suggests a need for interventions to increase accessibility.

Furthermore, the study emphasizes the necessity to broaden the scope of technical assistance, as indicated by the core farming activities learned from technical officers. While the coverage

includes essential topics like disease prevention and effective land utilization, there is room to expand into other critical areas such as crop diversification, sustainable practices, and modern farming technologies. The role of interpersonal networks, particularly friends and field officers, as primary sources of agricultural information, underlines the social aspect of knowledge dissemination. However, the limited utilization of media and agricultural shops as information sources indicates untapped potential in these channels for reaching a broader audience.

In conclusion, the research advocates for concerted efforts to enhance access to extension support programs, addressing both the availability and diversity of technical assistance. Strengthening community-based organizations, increasing the frequency of technical officer visits, and exploring alternative channels for information dissemination emerge as crucial strategies. By bridging these gaps, the agricultural community in South-Kivu can unlock its full potential, fostering sustainable practices and improving overall productivity. The study serves as a valuable foundation for policymakers, agricultural extension services, and community organizations to develop targeted interventions that positively impact agricultural outcomes in the region.

5.4 Recommendations

Recommendations for different stakeholders based on the research findings regarding access to extension support programs and agricultural productivity by farmers in South-Kivu, Democratic Republic of the Congo:

5.4.1 Government and policy makers

Develop and implement gender-sensitive agricultural policies to address disparities in land access and size between male and female farmers. Allocate resources for training and capacity-building programs to enhance the skills and knowledge of farmers, particularly focusing on modern farming practices and sustainable agricultural techniques. Strengthen extension services by increasing the number of farm technical officers, expanding the coverage of topics, and ensuring more frequent visits to farmers for personalized support.

5.4.2 Community-based organization and NGOs

Collaborate with government agencies to extend technical assistance programs, emphasizing the importance of community-based intermediaries like membership group field officers. Organize awareness campaigns and training sessions to promote the utilization of quality seeds, fertilizers,

and modern farming equipment, addressing the identified gaps in farm input supplies. Facilitate workshops and knowledge-sharing platforms to enhance agri-information access, leveraging social networks and emphasizing the role of field officers in information dissemination.

5.4.3 Financial institutions

Tailor credit facilities to meet the diverse financial needs and preferences of farmers, considering the affordability concerns highlighted in the research. Introduce flexible credit terms and collateral-free options to overcome the perceived barriers to credit access, fostering financial inclusion among the farming community. Collaborate with government and non-profit organizations to establish financial literacy programs to educate farmers on the benefits and responsible use of credit.

5.4.4 Educational institutions

Integrate agricultural education into school curriculums to ensure that future generations of farmers are equipped with the necessary knowledge and skills for sustainable farming practices. Offer specialized training programs and workshops for farmers with lower levels of education, addressing specific challenges they face in accessing technical assistance, information, and credit.

5.4.5 Media outlets

Increase coverage of agricultural information through various media channels to reach a wider audience, especially those not currently accessing agri-information. Collaborate with agricultural experts and organizations to produce informative content that educates farmers on modern farming practices, pest management, and other relevant topics.

5.4.6 Farmers' associations

Advocate for the rights of female farmers, ensuring equal access to resources such as land and affordable farm inputs. Facilitate knowledge-sharing platforms among farmers to promote the adoption of best practices and sustainable farming techniques. Establish support networks for farmers to navigate challenges related to credit access, providing guidance on available financial resources. These recommendations aim to address the identified gaps and challenges, fostering a more supportive and inclusive environment for farmers in South-Kivu, DRC.

5.5 Potential further research

Based on the research findings regarding access to extension support programs and agricultural productivity by farmers in South-Kivu, Democratic Republic of the Congo, several potential areas for further research can be explored:

In-depth analysis of extension support programs: Conducting a more detailed examination of specific extension support programs could provide insights into their effectiveness. Investigate the impact of different types of programs, such as training sessions, demonstrations, or one-on-one consultations, on farmers' knowledge, skills, and productivity.

Economic impact assessment: Investigate the economic impact of extension support programs on farmers. Assess changes in income, cost-effectiveness of the programs, and the overall contribution to rural economic development.

Climate change resilience: Examine the role of extension support programs in building resilience to climate change. Investigate how these programs can equip farmers with adaptive strategies to cope with changing environmental conditions.

Farmer-led extension programs: Explore the effectiveness of farmer-led extension programs where experienced local farmers take on the role of extension agents. Assess the peer-to-peer learning model and its impact on knowledge dissemination and adoption of best practices.

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APPENDICES

Appendix I: Facilitation of Research Letter

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu



16th August 2023

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – JESSICA KAHASHA

This is to introduce Jessica Kahasha who is a Master of Management in Agribusiness Student at Strathmore University Business School, admission number MMA/137839. As part of our MMA Program, Jessica is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MMA course. To this effect, Jessica would like to request appropriate data from your organization.

Jessica is undertaking a research paper on “**ACCESS TO EXTENSION SUPPORT PROGRAMS AND AGRICULTURAL PRODUCTIVITY BY FARMERS IN SOUTH-KIVU, DR CONGO.**” The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MMA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required. Yours sincerely,

A handwritten signature in black ink, appearing to read 'Njoki Kiagiri'.

Njoki Kiagiri Manager – Graduate Programmes

Strathmore University Business School.



MINISTÈRE
DE L'AGRICULTURE

Inspection Provinciale de
l'agriculture, Territoire de
Walungu
14 Av. Lieutenant Tondeur,
Walungu/Sud-Kivu
République Démocratique
du Congo
+243 994403036

05 Février 2024

OBJET : AUTHORIZATION DE RECHERCHE

Madame Jessica KAHASHA,

Suite à votre demande d'autorisation d'effectuer des recherches sur

« L'EFFET DES PROGRAMMES DE SOUTIEN A LA VULGARISATION
SUR LA PRODUCTIVITE AGRICOLE DES PETITS AGRICULTEURS
DANS LE TERRITOIRE DE WALUNGU AU SUD-KIVU, EN RDC »

J'ai le plaisir de vous informer que vous avez été autorisé à entreprendre
des recherches. Il vous est, par ailleurs conseillé, de partager les résultats
avec le bureau de l'inspection de l'agriculture de walungu.

Veuillez noter qu'en tant qu'étudiant, vous devez déposer une copie du
rapport final de recherche à l'inspection dans l'année suivant son
achèvement. La copie électronique de celui-ci doit également être
soumise sur demande.

Meilleures salutations,

Ir David M. Kajuguja,
Inspecteur agricole du territoire de Walungu
Sud-Kivu/République Démocratique du Congo

Adress : 14 Av. Lieutennt Tondeur, walungu/Sud-kivu, République Démocratique du Congo
Inspection Provinciale de l'Agriculture, Pêche, Élevage et Développement Rural (IPAPEL-DR)

Appendix III: Approval Letter from Strathmore as Substitute for Ethical Clearance



12th March 2024

Jessica Kahasha:

Student Number:137839

jessica.kahasha@strathmoree.edu

Dear Jessica,

**RE: Access to Extension Support Programs and Agricultural Productivity by Farmers
inSouth-Kivu, Democratic Republic of the Congo**

This is to inform you that the Office of Graduate Studies has today received your request on emailfor NACOSTI permit exemption given that you are conducting your study in South-Kivu, Democratic Republic of the Congo, and that there is no equivalent institution of NACOSTI in Democratic Republic of the Congo. You have henceforth obtained an Approval Letter from the Agricultural Ministry in South Kivu /DRC.

The office notes that: On the grounds of not having acquired the NACOSTI permit, with the reasons given. This is a letter for you to proceed with the next steps of your academic requirements.

Disclaimer: 1) This is not in any way an ethical approval letter. 2) Should there be any legal implications/actions emanating from the research in terms of any ethical violations, you will be personally liable.

Yours sincerely,

Dr. Bernard Shibwabo

Director of Graduate Studies

APPENDICES

Appendix I: Introduction Letter

Jessica Kahasha

Strathmore University-Kenya

P.O. Box 59857, 00200, City Square

Nairobi

22/09/2023

Dear Sir/ Madam,

Re: Request for Participation in Research

I am a student at Strathmore University-Kenya, pursuing a Master of Business Administration (MBA) Degree. I am currently conducting a study to determine the effect of extension support programs on agricultural productivity among small scale farmers in South-Kivu, DRC.

The attached questionnaire is aimed at collecting information that will be useful in the above-mentioned research area as part of the MBA degree requirements. Please note that the information gathered is strictly for academic purposes only and will be treated with the utmost confidentiality.

Your cooperation will be highly appreciated.

Yours Sincerely,

Jessica Kahasha

Appendix II: Structured Questionnaire for Farmers

The questionnaire seeks to collect data to determine the effect of extension support programs on agricultural productivity among small scale farmers in South-Kivu, DRC. The data is for the purpose of academic research only and confidentiality of information is guaranteed. The participation is voluntarily.

INSTRUCTIONS

Answer the questions in this template by ticking (✓) where best suits you or your answer.

SECTION A: SOCIO DEMOGRAPHIC INFORMATION

1. Gender of the farmer (tick) Male { } Female { }
2. Age of the farmer in years;
 Less than 20 years { } 21 – 30 years { }
 31 – 40 years { } 41 – 50 years { } Over 51 years { }
3. Educational level of the farmer
 None { } Primary { }
 Secondary { } Polytechnic { } University { }
 Any other.....{ }
4. Marital status;
 Not married { } Married { }
 Staying together { } Divorced { } Widowed { }
 Any other.....{ }
5. Average income of the generated from agricultural activities in Congolese CDF
 Less than 50,000 CDF { } 50,001-10,000 { } 100,001-150,000 { }
 150,001-200,000 { } Over 200,000 { }
6. Main source of income
 None { } Agricultural activities { } small business enterprises { }
 Employment { } Others (specify) { }.....
7. Number of household members
 1-3 { } 4-6 { } 7-10 { } Over 10 { }

SECTION B: ACCESS TO FARM INPUT

8. Do you access land for farming?

Yes { } No { }

9. If yes, what is the size of the land?

1/8 acre { } 1/2 acre { } 1 -2 acre { } 3-4 acre { } 5 acres and above { }
How do access of land enhanced your farming activities?.....

In no, how has it affected you farming activities.....

10. Do you access affordable farm input?

Yes { } No { }

How has access to farm input facilitated your farming activities?

.....

11. Where to you seek farm input for you farming activities?

Local agro shops { } Members group { } agro support NGOs { } Government agricultural agencies { } others (specify) { }.....

12. How readily available are the following farm input within your reach? Use options

Never – Rarely – Sometimes – Always – Often

Farm input	Never	Rarely	Sometimes	Always	Often
Quality seeds					
Fertilizers					
Farming equipment/machinery					
Pesticides and herbicides					
Animal health products					
Vegetative propagated planting material					

13. How affordable are the farm input?

Affordable { } Somehow affordable { } Very affordable { } Expensive { }

How has the costs of farm input affected farming activities?

.....

SECTION C: TECHNICAL ASSISTANCE

14. Do you access any forms of farming technical assistance?

Yes { } No { }

15. If yes, yes which forms of farming technical assistance?

.....

16. Where to you get technical advice?

Government agricultural officer { } NGOs field officers { }

Membership group field officer { } None { } Any other.....

17. Number of visits by a farm technical officer in a year?

None { } 1-3 visits { } 4 -6 visits { } 7-10 visits { } Over 10 visits { }

What core farming activities have you learned from technical officers?

.....

18. How frequently do you get technical advice from agricultural technical advisors from the government, NGOs or membership SACCO? The options are Never – Rarely – Sometimes – Always – Often

Technical advice	Never	Rarely	Sometimes	Always	Often
Land preparation and tilling					
Farm management and record keeping					
Seed selection and spacing					
Fertilizer type and use					
Administration of pesticides and herbicides					
Storage of farm produce					
Marketing of farm produce					

SECTION D: ACCESS TO AGRI-INFORMATION

19. Do you access agri-information of whatsoever?

Yes { } No { }

20. If yes, yes which forms of agri-information?

.....

21. Sources of agri-information?

Field officers { } Friends { }

Media (specify) { }..... Agricultural shops { } others, please
specify.....

22. How accessible are the following agr-information provided from agricultural government officers, NGOs or local SACCOs agriculture support programme? The options are Never – Rarely – Sometimes – Always – Often

Agr-information	Never	Rarely	Sometimes	Always	Often
When to prepare land for planting					
Timing when to plant based on weather patterns					
Keeping farm record right from planting to harvesting					
Identifying good quality seeds					
Selecting suitable farm chemical, including fertilizers, pesticides and herbicides					
Marketing and selling farm produce					

Best way of storing farm produce to minimize spoilage					
---	--	--	--	--	--

SECTION E: CREDIT ACCESS

23. Do you access any forms of credit facilities for your farming activities?

Yes { } No { }

24. Where to you seek credit facilities?

None{ } Banks { } Saccos { } Membership groups { }
 Informal lenders { } Family members/ friends { } Any other.....

25. How affordable is the credit facilities?

Not affordable { } Affordable { } Very affordable { } Somehow affordable { }

26. What makes it hard to access credit facilities?

Need for collateral { } Numerous requirements { }
 Few credit service providers { } Other reasons { }.....

SECTION F: AGRICULTURAL PRODUCTIVITY

27. How will you describe the farm produce?

Low { } High { }

28. Indicate the quantity of the following farm produce in kg in the past one year?

Crop	Actual output	Expected output
Cassava		
Corn		
Groundnuts		
Beans		
bananas		
Rice		
Sorghum		
Sweet potatoes		
Irish potatoes		
Vegetables		

Appendix III: Work plan

Activity	Apr to May 2023	June to July 2023	August to September 2023	October to November 2023	December 2023	January 2024	February 2024	March 2024
Proposal development								
Presentation								
Pilot testing								
Data Collection								
Data Coding and Editing								
Data Analysis								
Report Writing								
Submission								

Appendix IV: Research budget

Item Description	Quantity Description	Quantity	Unit Price - Kshs	copies/number of items	Cost- Kshs
Stationery	Pieces	1	2,000	2	4,000
Photocopying Services	Pages	55 pages	3	10	1,650
Typing	Pages	55 pages	10	9	4,950
Spiral binding	Pieces	20	100	-	2,000
Internet browsing	hours	90 days	ksh. 50	-	4500
Book binding	Pieces	10	400	9	36,000
Travel Charges	Person	4	1500	-	6,000
Data collection	Person	2	40,000	-	80,000
Contingency 10%					13,910
Total					153,010

Appendix V: Map of the targeted area (South Kivu)

