

BISHOP STUART UNIVERSITY



EFFECT OF GOVERNMENT AGRICULTURAL EXTENSION SERVICES ON FARM INCOME AMONG BANANA FARMERS IN LYANTONDE SUB COUNTY.

**KYARISIIMA MARY
23/BSU/MARI/4315**

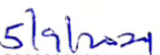
**A RESEARCH REPORT SUBMITTED TO THE DIRECTORATE OF
GRADUATE STUDIES RESEARCH AND INNOVATIONS IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF MASTER
OF AGRICULTURE AND RURAL
INNOVATIONS**

AUGUST 2024

DECLARATION

I **Kyarisiima Mary** do hereby declare that this is my original work and that it has never been submitted to any University or Institution of higher learning anywhere for the award of a degree or diploma.

Signed:

Date:

Kyarisiima Mary
(Student/Principal Investigator)

APPROVAL

This research entitled “Effect Of Government Agricultural Extension Services On Farm Income Among Smallholder Farmers In Lyantonde Sub County, Lyantonde District” was done under my guidance and therefore recommend it for examination.

Dr. Rebecca Kalibwani
Supervisor

R. Kalibwani
Signature

17/9/24
Date

Mr. Benard Tumusiime
Supervisor

B. Tumusiime
Signature

02/09/2024
Date

DEDICATION

This dissertation is dedicated to my parents, siblings, and friends for the moral and financial support they have rendered to me during my academic life.

ACKNOWLEDGMENT

First and foremost, I would like to extend a lot of thanks to the management and administration of Bishop Stuart University for the support rendered to me during my stay and academic life at the University.

Secondly, I extend my sincere gratitude to my supervisors Mr. Benard Tumusiime and Dr. Rebecca Kalibwani of Bishop Stuart University for accepting to be my academic parents as far as this research is concerned, especially for the direct and indirect unwavering support and guidance they gave me to reach this level of academia.

“You have been great to me in my academic life.”

ACRONYMS AND ABBREVIATIONS

GAES	-	Government Agricultural Extension Services
FAO	-	Food and Agriculture Organization
GDP	-	Gross Domestic Product
MAAIF	-	Ministry of Agriculture Animal industry and Fisheries
NAADS	-	National Agricultural Advisory Services
OWC	-	Operational Wealth Creation

TABLE OF CONTENTS

DECLARATION.....	Error! Bookmark not defined.
APPROVAL	Error! Bookmark not defined.
DEDICATION.....	iii
ACKNOWLEDGMENT	iv
ACRONYMS AND ABBREVIATIONS.....	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	viii
LIST OF TABLES	ix
ABSTRACT.....	x
CHAPTER ONE: INTRODUCTION.....	1
1.1. Background of the study	1
1.2. Statement of the problem	3
1.3. Objectives of the study	4
1.3.1. General objective	4
1.3.2. Specific objectives	4
1.4. Research questions.	4
1.5. Significance of the study	5
1.6. Conceptual Framework.....	5
CHAPTER TWO: LITERATURE REVIEW.....	7
2.0. Introduction	7
2.1. The role of extension services in agriculture	8
2.2. Evidence of Effect of Extension on Development Outcomes.....	10
CHAPTER THREE: METHODOLOGY	13
3.0. Introduction.....	13
3.1. Description of the Study Area	13
3.2. Research design.....	14
3.3. Sampling techniques and methods	14
3.3.1. Sampling procedure	14
3.3.2. Sample size determination.....	14
3.4. Data Collection Tools.....	14
3.4.1. Questionnaire.....	15
3.4.2. Interview guide.....	15

3.5. Data Analysis	15
3.5.1. Descriptive Analysis.....	15
3.5.2. Regression Analysis.....	16
3.5.3. Assessing the effect GAESs on farm income	17
3.6. Data Quality Control	17
3.6.1. Validity	17
3.6.2. Reliability	17
3.7. Ethical Considerations.....	18
CHAPTER FOUR: RESULTS AND DISCUSSION	19
4.1. Introduction	19
4.2. Socio-demographic characteristics of the respondents	19
4.5. The effect of accessing GAESs on farm income.....	24
4.5.1. Comparison of incomes between farmers accessing and not accessing GAES.	24
4.5.2. Comparison of incomes between farmers before and after accessing GAES.	25
4.6. Strategies for improving the delivery of GAES.....	26
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS	29
5.1. Summary	29
5.2. Conclusion.....	30
5.3. Recommendations	30
REFERENCES.....	31
APPENDIX.....	36
Appendix I. Interview Schedule for the banana farmers.	36
Appendix II. Guide for Key Informant Interviews	39

LIST OF FIGURES

Figure 1: The Conceptual Framework.	5
Figure 2: Map of the study area.	13
Figure 3: Comparison of incomes between farmers accessing and not accessing GAES.	24
Figure 4: Comparison of incomes between farmers before and after accessing GAES.	25

LIST OF TABLES

Table 1: Descriptive characteristics of respondents accessing and not accessing GAESs	20
Table 2: Factors influencing access to GAES.....	21
Table 3: The GAES delivered to banana farmers.	22
Table 4: Strategies for improving the delivery of GAES.	27

ABSTRACT

In Uganda, the agriculture extension program has been the main conduit for disseminating information on farm technologies, support rural adult learning and assist farmers in developing their farm technical and managerial skills. It is expected that extension programs will help increase farm productivity, farm revenue, reduce poverty and minimize food insecurity. In this study, we estimate the effects of extension services on farm income with reference to Government agricultural extension services (GAES) delivered by Ministry of Agriculture, animal husbandry and fisheries (MAAIF). The study used cross-sectional data collected from 165 banana farming households from Lyantonde subcounty. The data was analyzed using R software version 4.4.0. Using binary logistic regression model, access to agricultural credit ($p = 0.006$) and membership to a farmer association ($p < 0.001$) were found to significantly affect farmers' access to GAES. The study found positive economic gains from accessing the GAES i.e., having access to government agricultural extension services increased the banana farmers' farm income by UGX. 203,380/=-, significant at 5% ($p = 0.04$), with the farmers getting an average of UGX. 542,791/= after accessing GAES compared to before getting access to GAES, significant at 5% ($p < 0.001$). The study findings reaffirm the critical role of extension programs in enhancing farm income. It is, therefore, recommended that government agricultural extension service delivery should be boosted through timely recruitment, periodic training of agents and provision of adequate logistics.

Keywords: Agricultural extension, banana farming, GAES, logistic regression, farm income

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

Agricultural extension programs have served as a primary channel for tackling rural poverty and food insecurity, as they facilitate technology transfer, promote adult learning in rural areas, help farmers solve problems, and engage them actively in the agricultural knowledge and information system (Bonye et al., 2012; Rahman & Connor, 2022). As stated by Khalid and Sherzad (2019), extension encompasses “systems designed to enable farmers, their organizations, and other market participants to access knowledge, information, and technologies; promote their engagement with partners in research, education, agribusiness, and other pertinent institutions; and support them in enhancing their technical, organizational, and management skills and practices”. According to this definition, extension is considered a key instrument for enhancing the effectiveness and efficiency of agriculture, its associated activities, and other economic endeavors to better serve the needs of the population. Consequently, it is viewed as a policy tool aimed at promoting the safety and quality of agricultural products (Christoplos, 2010; Pan et al., 2018; Rahman & Connor, 2022).

Agricultural extension is acknowledged as an essential element for technology transfer, primarily focused on enhancing farmers' knowledge and skills to drive rural transformation and development. Thus, agricultural extension is a vital component in facilitating development (Pan et al., 2018).

Extension can help narrow productivity gaps among farmers by speeding up technology transfer, enhancing farmers' knowledge, and supporting them in refining their farm management practices (Alemu et al., 2023; Rahman & Connor, 2022). Further, agricultural extension services offer inputs and information that enhance human capital, which can significantly improve rural welfare (Anang et al., 2020; Danso-Abbeam et al., 2018).

Bonye et al. (2012) contended that extension serves as a valuable source of information on new technologies for farming communities, which, when adopted, can enhance production, increase incomes, and elevate living standards. Extension service providers disseminate innovations to farming households, act as catalysts in accelerating the adoption rate, and strive to prevent certain individuals within the system from halting the diffusion process (Alemu et al., 2023; Elias et al., 2013, 2016).

When engaging with farmers, extension officers demonstrate technology primarily to early adopters, as laggards tend to learn later from those who adopt first (Elias et al., 2013). Additionally, the provision of extension services helps in identifying farmers' challenges for further examination and to inform policy directions (Rahman & Connor, 2022).

Rahman & Connor (2022) asserted that extension services extend beyond mere technology transfer to encompass broader community development by fostering human and social capital, enhancing skills and knowledge for production and processing, facilitating market access and trade, organizing farmers and producer groups, and collaborating with farmers on sustainable natural resource management. In situations where market failures, such as restricted access to credit and non-competitive market structures, discourage farmers from production, extension services often offer solutions (Hasan & Otsuki, 2011).

According to Christoplos (2010), achieving growth in agricultural productivity is unattainable without the development and dissemination of improved agricultural technologies that can enhance productivity in smallholder agriculture. The importance of agricultural extension services in boosting value, productivity, and food security is widely acknowledged (Elias et al., 2013; Hasan & Otsuki, 2011; Rahman & Connor, 2022). Most of the previous studies assessing agricultural extension indicate a positive impact on farm productivity (Anang et al., 2019; Danso-Abbeam et al., 2018; Rahman & Connor, 2022), farm technical efficiency (Pan et al., 2018; Rahman & Connor, 2022), net farm income (Emmanuel et al., 2016), technology adoption (Bonye et al., 2012; Rahman & Connor, 2022), and poverty reduction (Lyne et al., 2018; Rahman & Connor, 2022).

A few notable studies do consider the characteristics of extension. For instance, Hasan and Otsuki (2011) demonstrated that total factor productivity was about five times greater among farmers utilizing private extension programs compared to those relying on government programs. Similarly, Ragasa and Mazunda (2018) found that receiving extension advice had a consistently insignificant impact on crop production and food security, apart from farmers who deemed the extension services as 'very useful'.

Agricultural extension services play a crucial role in enhancing banana production in Lyantonde District, Uganda (Mabaya et al., 2021; Mary et al., 2024). These services aim to

improve farmers' knowledge and practices, thereby increasing productivity and sustainability in banana farming. The extension services, by the government, provide training on best practices for banana cultivation, pest management, and post-harvest handling (Mary et al., 2024). They also facilitate access to quality seeds, fertilizers, and pest control measures, which are essential for improving yields, and farmers who utilize these services report an average yield increase of 30% (Kiconco et al., 2023). The government extension workers engage with local farmer groups, promoting collective learning and resource sharing, a community approach that has led to the establishment of over 50 farmer groups focused on banana production in the district (Mabaya et al., 2021; Mary et al., 2024).

While there are studies examining the impact of extension on the adoption of agricultural technologies (Emmanuel et al., 2016; Lyne et al., 2016; Pan et al., 2018), only a limited number of studies evaluate the effects of agricultural extension services on farm income resulting from the production of specific crops. Therefore, this paper adds to the current literature by evaluating banana farmers' access to government agricultural extension services, and the effect of this access on farm income.

1.2. Statement of the problem

Agriculture is the most important sector for sustaining growth and reducing poverty in Uganda, accounting for 85% of employment, 50% of exports, and 43% of gross domestic product (WorldBank, 2021). However, lack of knowledge and information of better production technologies, low level of modern inputs usage, the depletion of soil fertility, soil loss through erosion, and the high dependance on seasonal rainfall are still the major setbacks to ensuring sustainable agricultural production in the country (WorldBank, 2021).

In response to these numerous production challenges, the government of Uganda has implemented various extension programs, including NAADS and OWC (Mabaya et al., 2021). These initiatives aim at improving the transfer of agricultural information, knowledge, and skills to farmers; enhancing the supply and promotion of improved seeds and fertilizers; and conducting on-farm demonstrations of better farming practices and technologies (Kiconco et al., 2023). The goal is to achieve sustainable development in rural areas by increasing farm productivity (yields), reducing poverty, and enhancing food security (WorldBank, 2021). Therefore, the primary focus of extension services has been the broader

dissemination of improved farming technologies, management practices, and knowledge to smallholder farmers. However, the effectiveness of agricultural training services has been quite poor, despite the implementation of the national extension program.

Despite the extensive literature addressing topics related to agricultural extension, such as the adoption of improved agricultural technologies and the factors influencing this adoption, there is a lack of thorough evaluations of the effects of agricultural extension interventions. Using Lyantonde district as an example, extension services aimed at banana farmers have recently been introduced, following a shift from dairy farming to banana cultivation by these farmers. There is limited information and data available regarding banana production and the specific extension services designed to meet their needs. Therefore, this study seeks to evaluate the effect of accessing government agricultural extension services on farm income by utilizing farm-level data from banana farmers in Lyantonde subcounty.

1.3. Objectives of the study

1.3.1. General objective

To assess the effect of Government Agricultural Extension Services (GAESs) on farm income among banana farmers in Lyantonde subcounty.

1.3.2. Specific objectives

1. To establish the extent of accessing GAES among banana farmers in Lyantonde Sub County.
2. To examine the factors influencing the access of GAESs among the banana farmers in Lyantonde Sub County.
3. To establish the effect of accessing GAESs on farm income among the banana farmers in Lyantonde Sub County.

1.4. Research questions.

1. What is the extent of accessing GAES among banana farmers in Lyantonde Sub County?
2. What are the factors influencing the access of GAESs among the banana farmers in Lyantonde Sub County?

3. What is the effect of accessing GAESs on farm income among the banana farmers in Lyantonde Sub County?

1.5. Significance of the study

Knowledge of the effect of government agriculture extension services is vital because lack of this information is a hinderance to scaling up of agricultural technologies. This research was carried out to investigate the effect of government agricultural extension services on banana productivity and farm income among smallholder farmers in Lyantonde subcounty. The results of this study will hold significant value in the academic realm, as they will help address the research gaps left by previous scholars who explored related topics. Additionally, future researchers may reference this work for their own studies. Moreover, the findings can serve as valuable input for decision-making by policymakers, planners, and non-governmental organizations involved in agricultural extension services. Most importantly, this study will contribute to the existing literature on the effects of government agricultural extension services on banana productivity and farm income.

1.6. Conceptual Framework

The conceptual framework demonstrates how agricultural extension programs are utilized to enhance farmers' knowledge and skills, while also promoting and expanding the adoption of improved technologies, ultimately impacting the farm income of smallholder farmers.

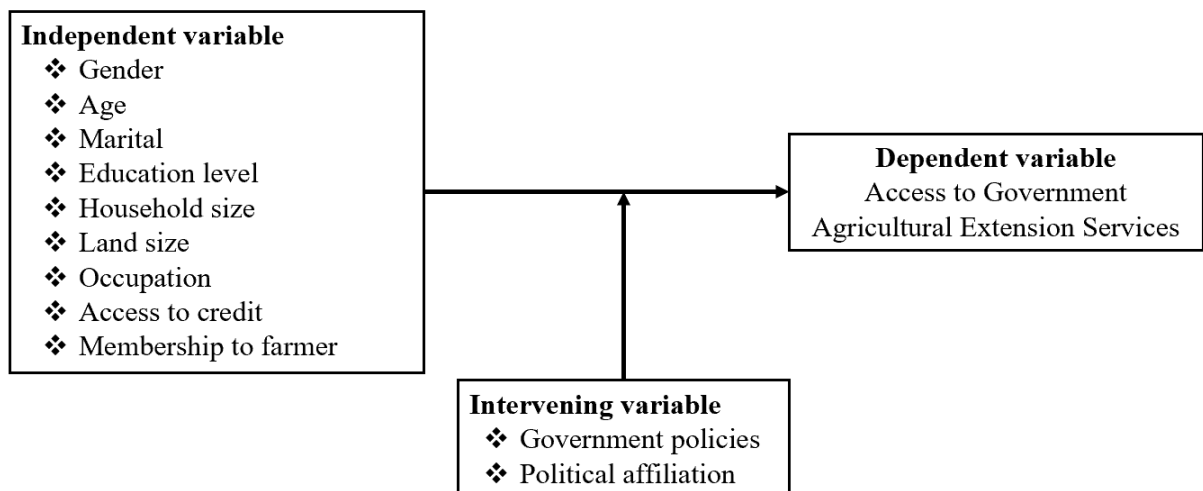


Figure 1: The Conceptual Framework.

It is widely recognized that agricultural extension and advisory services play a crucial role in agricultural development and can enhance the welfare of farmers and rural communities.

However, numerous factors influence the relationship between extension inputs and outcomes, and these factors interact in complex ways. Extension services can boost agricultural productivity and, consequently, farm income by accelerating technology transfer, increasing farmers' knowledge, and helping them improve their farm management practices. Nevertheless, access to agricultural extension services is affected by various factors (independent variables) such as gender, age, education level, marital status, household size, land size, occupation, membership in farmers' associations, access to credit, as well as intervening variables like government policies.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This chapter examines the literature related to the study as identified by other scholars on the same topic. It is essential as it highlights gaps or issues that may not have been addressed, providing a solid foundation for the research.

2.1. Overview of banana production in Lyantonde district

Banana production in Lyantonde district is historical, and in Lyantonde Sub County, it used to be done on a small scale of land size from a plot to a quarter of land for home consumption (Lyantonde District Local Government, 2020). It is of recent (10 years back) that people in Lyantonde Sub County have improved from banana production from local market level to urban market level. Apparently, banana production in Lyantonde is practiced on 1 to 5 acres of land. According to District Development plan 111(DDP 1110 FY 2020/2021 – FY 2024/2025, approximately 55% are involved in subsistence agriculture, less than 19% of the farmers are involved in large scale farming with majority operating on small pieces of land where they grow both perennial and annual crops.

On average each household in Lyantonde Sub County produces 2 bunches per week whereby one bunch is taken to market and one bunch for home consumption (Lyantonde District Local Government, 2020). On estimate each household produces four bunches for sale monthly at an average price of 10,000shs. Total banana production annually for sale per household being 48 bunches at average price of 10,000 earning total income of 480,000 annually. Therefore, on average total banana production in Lyantonde Sub County annually is approximately 373,344 bunches of matooke where 186,672 is for sale and 186,672 for home consumption (Lyantonde District Local Government, 2020).

The key perennial crops grown include bananas (Matooke), coffee, and fruits such as Mangoes, passion fruits and avocados while annual crops include maize, beans, vegetable such as onions and tomatoes. Crop production is dominated by women in the downstream stages of production like tilling of land, planting, weeding and harvesting whereas men are more involved in the upstream stage of production like value addition and marketing and therefore control the proceeds from agriculture.

Despite the potential for higher production and productivity, the district has encountered a number of challenges such as lack of market information for agricultural products, poor value addition chain, land fragmentation, poor soils leading to inferior products, low quality products, poor farming skills, lack of agricultural extension support, climate change that characterized by floods, erosion, landslides, heavy winds, poor seeds and seedlings, pests, poor road networks, low prices coupled with lack of markets, diseases and poor farming practices (Atuhaire et al., 2014; Lyantonde District Local Government, 2020). Most of the farmers own small plots of land of less than five acres from which they partition gardens implying that mechanized farming practices are not possible despite the support (Lyantonde District Local Government, 2020; Mary et al., 2024).

2.2. The role of extension services in agriculture in banana production

Historically, public extension has served as a vital source of agricultural information in rural regions (Gathu, 2021). Additionally, extension plays a significant role in enhancing production efficiency by encouraging technological advancements among farmers. There is a pressing need to establish a new vision for agricultural extension, positioning it as central to public service for food security, especially considering increasing external pressures like globalization Amrullah et al. (2023). Gathu (2021) noted that a key indicator of a successful extension program is the farmers' awareness and adoption of the technological elements provided through extension, as this serves as a basis for evaluating potential economic impacts. Berhane et al. (2018) further emphasized that “extension services are essential for enabling producers to achieve higher production and productivity by accessing information for marketing and other support services critical for agricultural development, poverty alleviation, and overall progress.”

According to Sahu et al. (2024), agricultural extension consists of a series of integrated communicative interventions designed, among other objectives, to foster and/or stimulate innovations that aim to address (often multi-actor) challenging situations. It has been noted that agricultural extension plays a role in public information and education initiatives that can aid farmers in alleviating the impacts of climate change.

Agricultural extension systems have significantly shaped the development of modern agriculture and the practices of farming families. Effective extension services consistently

adjust to shifts in the agricultural landscape and the needs of the farming communities. As agents of change, extension services must evolve to remain relevant, survive, and deliver value for money (Sahu et al., 2024). They must continuously adapt to the evolving agricultural environment and the changing circumstances of farm families to maintain their relevance. One critical area of focus for these services is addressing climate change and its associated impacts.

Extension services are crucial for empowering farmers to enhance their practices and effectively tackle emerging challenges. The knowledge, concepts, and abilities gained from extension programs can help farmers enhance their productivity, reduce losses, and improve their market access. The beneficial impact of extension services is clearly evidenced worldwide. Extension activities are formulated through program development. According to Brenya and Zhu (2023), extension programming can take a proactive or reactive approach.

Extension services are proactive, responsive, and collaborative entities committed to promoting growth and development through continuous learning. Reactive programming entails actions or adjustments made in response to changes viewed as losses or threats. In this approach, extension workers often spend most of their time and resources addressing requests that lack a central focus or objective. In contrast, proactive programming focuses on preparing for expected changes and adopting new or varied approaches, seeing change as an opportunity. Proactive programs provide a thorough educational initiative specifically aimed at facilitating change and positively influencing the lives of individuals and communities.

The prefix "Pro" comes from Latin, meaning "in favor of" or "for," and has Greek roots, signifying "before," "prior to," or "earlier than." In the context of programming, this suggests that the educational initiative is well thought out and that the extension worker understands the complex interrelated factors necessary for directing change. This means that the extension worker possesses a philosophical foundation for program development, recognizes the importance of organizational structure in educational programming, comprehends the program development process, is aware of the required resources, and has a framework for prioritizing initiatives.

Reactive and proactive responses to change are not separate; instead, they exist on a continuum. Individuals may have a general disposition toward change, indicating that they usually respond in a particular way. However, it is also true that, depending on the significance of a specific change, a person may react differently than usual (Baruwadi et al., 2020; Sahu et al., 2024). For example, an individual may typically respond to change in a positive and proactive manner. However, that same person might experience a significant sense of loss if they were to lose a job or business that they believe defines their identity. A solid understanding of proactive programming acknowledges the necessity of dedicating time to reactive work (Ali & Rahut, 2013). A considerable amount of effective extension work is accomplished by addressing clients' requests. Through reactive efforts, individuals learn, problems are resolved, and practices are modified (Acharya et al., 2022). The amount of time allocated to reactive work varies based on several factors, including the number of extension workers in the county, the level of specialization of the agents, the diversity of clientele, the variety of the economy, and the population size, among others (Benin et al., 2011; Bonou-Zin et al., 2022; Brenya & Zhu, 2023; Cawley et al., 2018).

In Uganda, Shimali et al. (2016) and Pan et al. (2018) found that the adoption of agricultural extension services aimed at enhancing cultivation methods led to increased agricultural production, savings, and wage income. While numerous studies have evaluated the impact of extension services, most consider the presence or absence of extension as a binary variable to assess treatment effects (Sennuga et al., 2020; Shimali et al., 2016). Fewer studies explore how the type of provider (e.g., government or private) and the frequency of contact (number of extension visits) influence the welfare of farm households. To fill this knowledge gap, this article examines the effects of access to agricultural extension, the frequency of visits, and the type of provider on the application of chemical fertilizers, crop yields, and profits.

2.2. Evidence of Effect of Extension on Development Outcomes

Current evidence emphasizes the relationship between agricultural technology and poverty reduction in Sub-Saharan Africa (Onwuka et al., 2017). While the delivery of knowledge and skills is a crucial component of farmers' ability to achieve higher agricultural yields (Ogunniyi et al., 2018). Many farmers in Africa are hesitant to adopt new technologies due to insufficient knowledge on how to implement these methods (Mphepo & Urassa, 2022). A

substantial body of literature indicates a positive relationship between engagement with extension services and farm productivity (Hasan & Otsuki, 2011).

The training and visit system of extension in Kenya, along with the ratio of extension workers to farms, has been shown to improve farm productivity (Hasan & Otsuki, 2011). A prior study also indicates that extension consultations have a significantly positive impact on farm productivity in Zimbabwe (Lyne et al., 2018). Indeed, extension services are likely to boost crop production, which subsequently facilitates the marketing process (Emmanuel et al., 2016). Conversely, some existing evidence suggests that agricultural extension has a limited impact on farm income and productivity in many African countries (Ragasa et al., 2013; Ragasa & Mazunda, 2018). Nonetheless, much of the empirical research conducted in African nations may have underestimated the importance of extension services (Ragasa et al., 2013).

Earlier literature emphasizes that extension services play a crucial role in poverty reduction by enhancing the adoption of improved farming practices and increasing individual farmers' capacities (Emmanuel et al., 2016). Previous studies have explored both the worker and allocative effects to assess the impact of education (Ragasa et al., 2013). Firstly, the worker effect indicates the worth of the marginal product of education, signifying a worker's ability to produce greater output because of their education. Second, the allocative effect refers to the improved ability to select an appropriate quantity of purchased resources and optimally allocate both bought inputs and farm-supplied inputs, known as input-allocation and input-selection effects (Beshir et al., 2012). The input-allocation effect pertains to the efficient distribution of resources among competing uses, while the input-selection effect pertains to choosing the correct number of inputs (Toraitich, 2021).

2.3. Theories explaining the effect of accessing agriculture extension on farm income.

Several theories explain the effect of agricultural extension on farm income:

Human Capital Theory: This theory posits that education and training enhance farmers' skills and knowledge, leading to improved agricultural practices and increased productivity. As farmers adopt better techniques through extension services, their income is likely to rise (Olaleye et al., 2024).

Technology Adoption Theory: This theory suggests that agricultural extension facilitates the adoption of new technologies and practices, which can lead to higher yields and income. By providing information and support, extension services help farmers overcome barriers to adopting innovations (Suvedi et al., 2017).

Diffusion of Innovations Theory: This theory describes the process by which new ideas and technologies spread within a community. Agricultural extension plays a critical role in this process by promoting innovations and encouraging farmers to adopt them, ultimately enhancing farm income (Miller, 2015).

Input-Output Model: This model analyzes the relationship between inputs (such as labor, land, and capital) and outputs (crop yields and income). Agricultural extension services improve farmers' ability to allocate resources efficiently, leading to increased productivity and income (Marlianti et al., 2017).

Livelihoods Framework: This framework emphasizes the importance of various assets (human, social, financial, physical, and natural) in improving livelihoods. Agricultural extension enhances these assets by providing knowledge and resources, which can lead to increased farm income (Teshager et al., 2019).

These theories collectively highlight the multifaceted impact of agricultural extension on farm income, emphasizing the importance of education, technology adoption, and resource management.

CHAPTER THREE: METHODOLOGY

3.0. Introduction

This chapter outlines the methodology for conducting the study. It details the research design, the target and accessible populations, the sampling techniques and size, the methods and instruments for data collection, the procedures for gathering data, the methods of data analysis, ethical considerations, and the study's limitations.

3.1. Description of the Study Area

This study was carried out in the Lyantonde subcounty of Lyantonde district (Figure 2), which is divided into five parishes: Kalagala, Kirowoza, Katovu, Biwolombo, and Kyewarula. Each parish typically comprises an average of five villages. Agriculture is the primary economic activity in the area, accounting for approximately 95% of the residents' livelihoods, supported by an average annual rainfall of 1400 mm to 1800 mm and an annual daily average temperature ranging from 11°C to 25°C. Bananas are predominantly cultivated for both food and cash, while coffee is primarily grown for cash, positioning the district as one of the leading banana producers in the country. Other crops cultivated in the region include cassava, sorghum, beans, groundnuts, sweet potatoes, onions, and cotton.

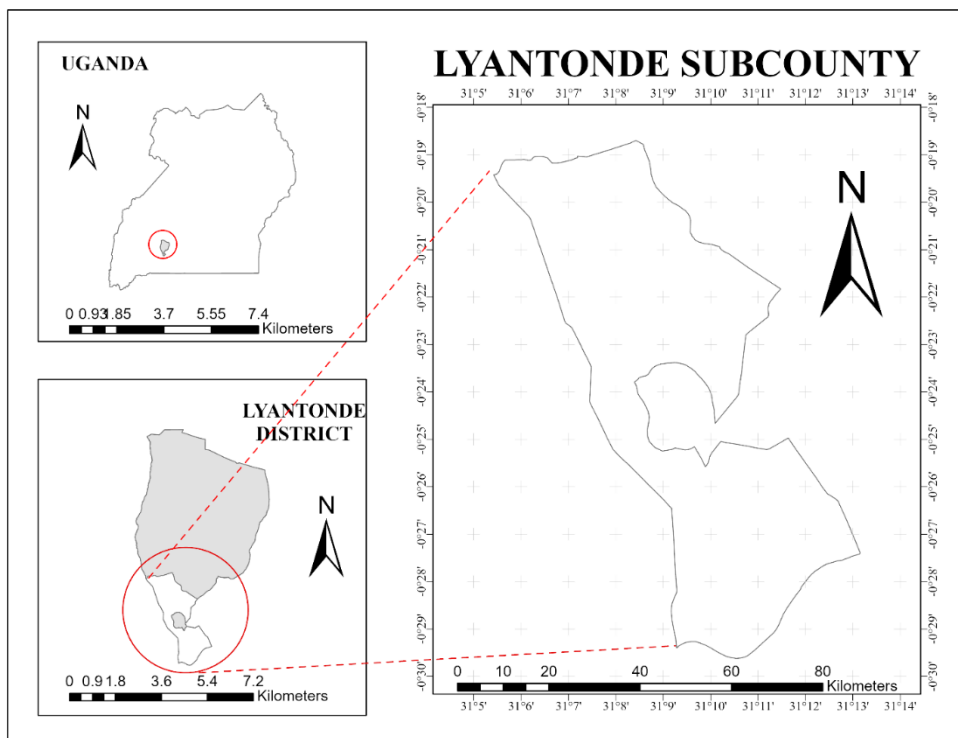


Figure 2: Map of the study area.

3.2. Research design.

The cross-sectional survey design was adopted and used in this study to collect data from many different individuals at a single point in time. Data was gathered using both quantitative data (using a questionnaire) and qualitative data (key informant interviews). Their responses allowed the researcher to cross-verify multiple data sources, enhancing confidence in the validity of the study's conclusions. (O’Cathain et al., 2010).

3.3. Sampling techniques and methods

3.3.1. Sampling procedure

The study targeted smallholder farmers and key informants like extension service providers and community-based facilitators. The farmers in each chosen village were divided into two groups (i.e., those accessing and not accessing) Government Agriculture Extension Services (GAESs) basing on the lists from the local leaders and agriculture extension workers. Purposive sampling method was used in the selection of key informants for their technical knowledge, advisory services, and policy implementation.

3.3.2. Sample size determination.

The sample size was determined by Kish (1965) formula. Based on the formula, the sample size was calculated with a certain level of accuracy regarding the general population utilized.

$$n = p \times q \times \left(\frac{Z}{e} \right)^2 \dots\dots\dots(1)$$

Where: n = Sample size; p = population involved in banana farming = 60% = 0.6; q = young population and those involved in other ventures = 35% = 0.35; e = standard error = 5% = 0.05; and $Z_{1/2}$ = Z value of 95% confidence = 1.96 from the Z-table. Substituting the values into the formula:

$$n = 0.6 \times 0.35 \times \left(\frac{1.96}{0.05} \right)^2 = 165$$

Therefore, the sample size comprised of 165 respondents.

3.4. Data Collection Tools

Primary data was captured using the questionnaires and interview guides.

3.4.1. Questionnaire

A semi-structured questionnaire was used to capture primary data from selected farmers. The survey questionnaire was divided into three sections. Section (1) captured information on demographic factors of smallholder farmers, such as gender, age, marital status, education level, household size; socio-economic factors such as land size and source of income; and institutional factors such as access to agricultural credit, and membership to farmer associations. Section (2) included questions about extension services, such as (a) whether the farmer had contacted extension agents, (b) whether the extension advice pertained to banana production, (c) the frequency of contact between extension agents and farmers, (d) the level of satisfaction farmers have with the services received, and (e) the mode of service delivery (face-to-face or via mobile phone). Section (3) collected data on the outcome variable, specifically farm income among respondents who accessed GAESs and those who did not.

3.4.2. Interview guide.

Key informant interview guide was used as a tool for qualitative data collection. It involved oral questioning to facilitate face-to-face interaction with key respondents i.e., the agriculture extension officers who interact with farmers and understand the drivers and constraints to accessing GAESs. While interviewing, probing was applied in cases where respondent did not give adequate answers. This data provided a more complete picture of what is happening in the area concerning access to GAESs, and its effect on farm income generated from banana production.

3.5. Data Analysis

The data was captured, cleaned and coded in Microsoft Excel 365. It was then subjected to the analysis using R software version 4.4.0 (R Core Team, 2024).

3.5.1. Descriptive Analysis

This was done to identify the banana farmers accessing and not accessing GAESs. The collected quantifiable data was analyzed using descriptive statistics, such as frequencies and percentages, with the results displayed in tables and charts.

3.5.2. Regression Analysis

This was done to examine the factors associated with accessing GAESs among banana farmers. In this study, the researcher assumed that a banana farmer accessing GAESs gains more knowledge and skills which improve banana production and therefore farm income generated from banana production compared to a farmer not accessing GAESs. The dependent variable is a binary choice variable i.e., a "Yes" (accessing GAESs) or "No" (not accessing GAESs) type variable. Hence the logit model was used to estimate parameters using maximum likelihood. The probability, that a banana farmer accesses GAESs is given by:

If X represents the set of parameters that affect access to GAESs by i^{th} banana farmer, then U_i is an indirect utility derived from the GAESs access situation and is a function of explanatory variables (X) and is expressed as shown in equation (2):

$$U_i = \beta_0 + \sum_{i=1}^n \beta_i X_i \varepsilon \quad (2)$$

Where, β_0 is the intercept term, and $\beta_1, \beta_2, \dots, \beta_i$ are the coefficients associated with each explanatory variable $X_1, X_2, \dots, X_i$. Therefore, the probability the farmer accessing GAESs influenced by (X_i) factors is given by equation (3):

$$P_i = \frac{e^{U_i}}{1 + e^{U_i}} \quad (3)$$

Where, P_i is the probability that i^{th} farmer has access to GAESs. Taking the natural logarithms of

the odds ratio (in favor of accessing GAESs) of equation (2), the prediction equation for the farmer is presented in equation (4)

$$\text{Logit}(P) = \ln \left[\frac{P_i}{1 + P} \right] = \beta_0 + \sum_{i=1}^n \beta_i X_i \varepsilon \quad (4)$$

Where, $\text{Logit}(P)$ is log of the odds ratio in favor of accessing GAESs, which is not just linear in X_i , but also linear in the parameters used in the model. Therefore, if the stochastic disturbance term (Z_i), is introduced here, the logit model in this case becomes:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + U_i \quad (5)$$

This model can be estimated through the iterative maximum likelihood (ML) estimation method.

3.5.3. Assessing the effect GAESs on farm income

To assess the effect of having access to GAESs on farm income of banana farmers in the study area, mean comparison of farm income among banana farmers accessing and not accessing GAESs was used.

3.6. Data Quality Control

3.6.1. Validity

The validity of the questionnaires was determined by pre-testing the instruments before the actual data collection. The researcher recruited four (4) enumerators acquainted with the study area's culture and language. Pretesting was done by both the researcher and the enumerators administering questionnaires to fifteen (15) respondents within the study population. The enumerators received training on administering the questionnaire, and in collaboration with the investigator, they thoroughly reviewed each questionnaire completed during the pre-testing phase, addressing any unclear issues. The Content Validity Index was calculated using the content validity ratio, following Amin (2005) formula:

$$CVI = \frac{\text{Total number of items rated relevant by experts}}{\text{Total number of items}} \dots\dots\dots(7)$$

A Content Validity Index (CVI) value of 0.83 was achieved, indicating that it exceeds the recommended threshold of 0.7 set by Amin (2005), thus confirming that the instrument is valid for data collection.

3.6.2. Reliability

This is a measure of how reproducible the survey instrument's data are (Fink & Litwin, 1995). The reliability of the research was calculated from the formula.

$$\alpha = \frac{N * \bar{c}}{\bar{v} + (N - 1) * \bar{c}} \dots\dots\dots(8)$$

Where N represents the number of items, $\bar{c}$ is the average inter-item covariance among the items and $\bar{v}$ equals the average variance. A reliability value of 0.84 was obtained, indicating that the instrument is deemed reliable for data collection (Santos, 1999).

3.7. Ethical Considerations

The researcher utilized ethical guidelines outlined by Lichtman (2013) as a framework for the study. Initially, ethical approval was secured from the Research and Ethics Committee of Bishop Stuart University. Secondly, at the beginning of data collection, the researcher obtained approval from village local council chairperson and finally a written informed consent will be obtained from each participant after giving a description of the study before actual data collection. Participants were guaranteed confidentiality of the information they provided. This was preceded by a thorough explanation of the aim and objectives of the study. Participation was based on informed oral or written consent. Respondents for the study were informed of their rights to withdraw from the study at any time they deem necessary. They were fully assured of their privacy and confidentiality. Confidentiality of data was maintained by use of identification numbers.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Introduction

This section presents the results, their interpretation, and discussions. These include banana farmers' demographic characteristics, access or no access to GAES; the factors influencing access to GAES; and the effect of accessing GAES on farm income generated from the sale of bananas in the study area.

4.2. Socio-demographic characteristics of the respondents

The farmers were requested to give basic information, such as their gender, age, level of education, household size, household income, marital status, major occupation, land size, access to credit, and membership to farmer association. Table 1 reveals that more than half of the banana farmers (58.2%) have access to GAESs. Most of the respondents i.e., 57.6% are females. This suggests that women are actively engaging with agricultural extension services, which can be significant in contexts where women play a vital role in agriculture. The higher percentage of female access may reflect targeted outreach efforts by GAES to include women or may indicate that women are more likely to seek assistance for their farming needs. Most of the banana farmers i.e., 83.1% are within the age bracket of 20 – 50 years – showing a very big number of productive groups capable of providing enough labor and commitment to increasing banana production in the area. This finding concurs with those of Andersen (2017) and Midamba and Kizito (2022) who found that farmers whose ages range from 25 to 47 years were active and had great chances of participating in agricultural activities and this, in most cases, increases the chances of accessing extension services to produce more. A big proportion of banana farmers, i.e., 85.5% have had formal education. This means that they know how to read and write, a characteristic that makes them better candidates for training in the GAESs program. More than 50% of the farmers have access to agricultural credit (53.9%). Eighty-one (81.2%) of the respondents stated that farming is their major occupation in the study area. This means that the sample used is the right one and are in position to provide the necessary information concerning farming activities. More than half of the respondents i.e., 55.2% revealed that banana farming is their major source of income (*Banana Soc.Inc.*). In addition, it was also found that 55.8% of the respondents are members of the banana farmers association (*Assoc. member*), where they get information pertaining the banana agronomic practices and other services like marketing and credit. On average, each

household accessing GAESs had 6 members and 7 acres of land. The households not accessing GAESs had an average of 4 members and about 5 acres of land. Overall, out of 165 respondents, only 96 i.e., 58.2% had access to GAESs in the study area.

Table 1: Descriptive characteristics of respondents accessing and not accessing GAESs

Variable	Not accessing GAESs (N=69)	Accessing GAESs (N=96)	Overall (N=165)
<i>Gender</i>			
Female	40 (58.0%)	55 (57.3%)	95 (57.6%)
Male	29 (42.0%)	41 (42.7%)	70 (42.4%)
<i>Age</i>			
21 - 30	12 (17.4%)	8 (8.3%)	20 (12.1%)
31 - 40	31 (44.9%)	25 (26.0%)	56 (33.9%)
41 - 50	15 (21.7%)	46 (47.9%)	61 (37.0%)
51 - 60	8 (11.6%)	15 (15.6%)	23 (13.9%)
Above 60	3 (4.3%)	2 (2.1%)	5 (3.0%)
<i>Education level</i>			
No schooling	9 (13.0%)	15 (15.6%)	24 (14.5%)
Primary	28 (40.6%)	34 (35.4%)	62 (37.6%)
Secondary	13 (18.8%)	35 (36.5%)	48 (29.1%)
College	19 (27.5%)	12 (12.5%)	31 (18.8%)
<i>Access to agricultural credit</i>			
No	55 (79.7%)	21 (21.9%)	76 (46.1%)
Yes	14 (20.3%)	75 (78.1%)	89 (53.9%)
<i>Marital status</i>			
Single	10 (14.5%)	3 (3.1%)	13 (7.9%)
Married	41 (59.4%)	71 (74.0%)	112 (67.9%)
Divorced	5 (7.2%)	6 (6.3%)	11 (6.7%)
Widowed	13 (18.8%)	16 (16.7%)	29 (17.6%)
<i>Occupation</i>			
Non-farming	28 (40.6%)	3 (3.1%)	31 (18.8%)
Farming	41 (59.4%)	93 (96.9%)	134 (81.2%)
<i>Banana Soc.Inc.</i>			
No	48 (69.6%)	26 (27.1%)	74 (44.8%)
Yes	21 (30.4%)	70 (72.9%)	91 (55.2%)
<i>Assoc. Member</i>			
No	58 (84.1%)	15 (15.6%)	73 (44.2%)
Yes	11 (15.9%)	81 (84.4%)	92 (55.8%)
<i>Land size</i>			
Mean (SD)	4.83 (2.82)	7.34 (3.82)	6.29 (3.65)
<i>Household size</i>			
Mean (SD)	3.96 (2.32)	5.92 (2.19)	5.10 (2.44)

4.3. Factors influencing participation in GAES.

The logistic model was employed to predict access to GAESs using nine independent variables. Standardized parameters were derived by applying the model to a standardized version of the dataset. Additionally, 95% Confidence Intervals (CIs) and p-values were calculated using a Wald z-distribution approximation. The model's explanatory power was found to be substantial (Tjur's $R^2 = 0.62$). Within this model, only two (2) factors i.e., access to agricultural credit and membership to farmers association were found to significantly influence access to GAES by the banana farmers in the study area.

Table 2: Factors influencing access to GAES.

Variable	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-3.454	1.496	-2.309	0.021
Gender (Male)	-0.201	0.656	-0.306	0.760
Age				
31 – 40	-1.923	1.012	-1.900	0.057.
41 – 50	-0.258	0.937	-0.275	0.783
51 – 60	-1.073	1.204	-0.891	0.373
Above 60	0.370	2.237	0.165	0.869
Education level				
Primary	0.447	0.799	0.559	0.576
Secondary	1.753	0.918	1.910	0.056.
College	0.442	1.039	0.425	0.671
Land size	0.127	0.095	1.337	0.181
Household size	0.131	0.132	0.988	0.323
Access to agricultural credit (Yes)	1.706	0.624	2.735	0.006**
Marital status				
Married	-1.176	1.280	-0.919	0.358
Divorced	0.347	1.502	0.231	0.817
Widowed	-0.818	1.466	-0.558	0.577
Occupation (Farming)	0.926	0.998	0.928	0.353
Banana is the main source of income (Yes)	0.642	0.678	0.948	0.343
Membership to farmer association (Yes)	2.959	0.591	5.009	0.000***

* Significance. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The other factors i.e., gender, age, education level, land size, household size, marital status, occupation and banana being a major source of income had no statistically significant influence on access to GAES in the study area. The effect of agricultural credit is statistically significant and positive (beta = 1.71, 95% CI [0.52, 3.00], p = 0.006). This means that having access to agricultural credit increases the likelihood of accessing GAESs. This is so because

most of the extension services target farmers who have progressed and are serious with farming (most of which use credit from financial institutions) to act as model farmers. This finding agrees with the findings of Masanja et al. (2023) and Anang et al. (2020). In addition, farmers who have access to credit can adopt most of the farming technologies and therefore their farms are used as demonstration sites by the government extension workers. Because of this, most of the banana farmers doing well (attributed to having access to credit) are usually targeted by the government extension workers and therefore they are always accessing GAESs. This finding is in line with that found by Mohamed and Temu (2008). The effect of being an association member is statistically significant and positive (beta = 2.96, 95% CI [1.87, 4.21], $p < .001$). This means that being a member to a farmers' association increases the likelihood or the chances of accessing GAESs. This could be attributed to the fact that extension agents tend to deliver the services to organized individuals because of a big extension to farmer ratio i.e., 1:5000. Therefore, it not surprising to get this finding, which was also found by Masanja et al. (2023) in their study to examine factors influencing rural farmers' access to agricultural extension services provided by private organizations in Kibondo district, Tanzania. In addition, this finding is in agreement with other studies by Midamba and Kizito (2022), Nagar et al. (2021) and (Abdallah & Abdul-Rahaman, 2016) who indicated that group membership has a significant impact on farmers' access to extension services, as most farmers tend to join agricultural-related groups to share and exchange ideas pertinent to agriculture, which are crucial for enhancing agricultural production and facilitating easier access to extension services.

4.4. The GAESs delivered to banana farmers.

The banana farmers who were accessing the GAESs were asked about the services they were getting from this program. Their responses were recorded and are summarized in table below.

Table 3: The GAESs delivered to banana farmers.

Services	No		Yes	
	Frequency (N=96)	%	Frequency (N=96)	%
1. Planting materials e.g. suckers	17	17.7	79	82.3
2. Agro-chemicals e.g. fertilizers and pesticides	48	50.0	48	50.0
3. Farm visits	26	27.1	70	72.9
4. Trainings/Workshops/Conferences	15	15.6	81	84.4

Attending trainings ranked high as one of the services obtained from the government agriculture extension program. This was followed by the provision of planting materials in the form of seeds and cuttings of different crops. From the interview with one of the key informants,

“Through the National Agricultural Advisory Services (NAADS) program and the Operation Wealth Creation (OWC), we identify the needs of the farmers and provide the available materials to support them. We are giving the farmers resistant banana varieties which are also high yielding. These have been received positively by the farmers and we are scaling it out to those that have not benefited.”

For farm visits, only 73% of the respondents indicated that they exist. The farmers and key informants stated that *“Few of them are on individual basis but rather on group basis. This is where they converge at a demonstration site to learn new practices. There are also individual farm visits but the farmer to be visited connects with the officer in charge to come and advise accordingly”*. This finding is in line with that of Ganpat et al. (2017) in their study of assessing the impact of farm visits on farmers' satisfaction with extension in the Caribbean.

Provision of agrochemicals was mentioned by half of the farmers participating in the government agriculture extension program. This is because they are not provided for free but at a subsidized price, which some farmers are unable to pay. This concurs with the finding of Baloch and Thapa (2018). Also, in line with this, a key informant said that.

“Farmers expect the fertilizers are for free and so they refuse to procure them even when they have the capacity so that they get them for free out of sympathy. This calls for a mindset change because the use of these agrochemicals has become part and parcel of crop production because of climate change”.

Provision of agrochemicals was mentioned by half of the farmers participating in the government agriculture extension program. This is because they are not provided for free but at a subsidized price, which some farmers are unable to pay. In line with this, a key informant said that.

“Farmers expect the fertilizers are for free and so they refuse to procure them even when they have the capacity so that they get them for free out of sympathy. This calls for a mindset change because the use of these agrochemicals has become part and parcel of crop production because of climate change”.

4.5. The effect of accessing GAESs on farm income.

To ascertain the effect of accessing GAESs on farm income resulting from the sale of bananas among the respondents in the study area, the incomes of farmers accessing and not accessing GAESs were compared. In addition, the incomes of farmers before and after accessing GAESs were also compared. The findings are presented in the sections below.

4.5.1. Comparison of incomes between farmers accessing and not accessing GAES.

The respondents (both accessing and not accessing GAES) were asked to indicate their annual farm income from the sale of bananas. Their stated incomes were recorded and analyzed/compared using the *ggbetweenstats ()* function from the *ggstatsplot* R package. The results are visually represented in Figure 3.

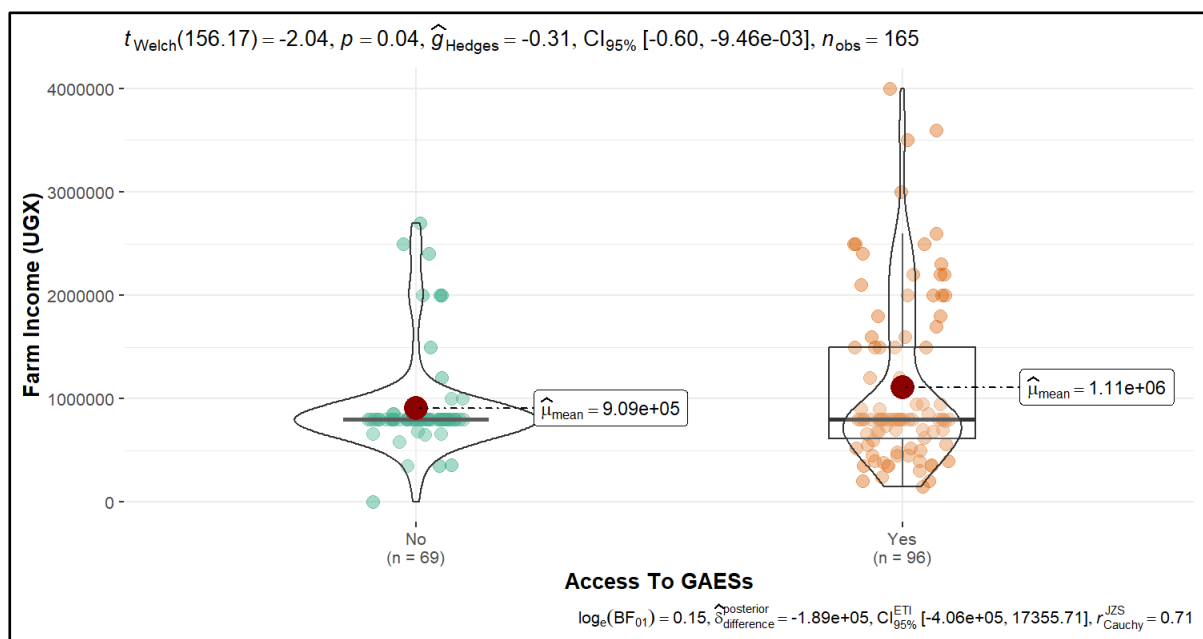


Figure 3: Comparison of incomes between farmers accessing and not accessing GAES.

The results from this test (Figure 4) reveal that banana farmers who had access to government agriculture extension services had an average farm income of UGX. 1,111,979/= while those who did not have access to government agriculture extension services had an average farm income of UGX. 908,599/=. This means that having access to government agricultural extension services increased the banana farmers' farm income by UGX. 203,380/=: significant at 5% ($p=0.04$). This implies a strong confidence that the effect observed (in this case, the increase in income) is real and not random. The p-value of 0.04 indicates that there

is less than a 4% probability that the observed increase in income happened by random or chance if there were no actual effect. Since this value is below the standard 0.05 threshold, it supports the conclusion that access to extension services has a real positive effect on income.

4.5.2. Comparison of incomes between farmers before and after accessing GAES.

The respondents were asked to report about their farm income (from the sale of banana) before and after accessing the government agricultural extension services. Their stated incomes were recorded and analyzed/compared statistically using the *ggbetweenstats ()* function from the *ggstatsplot* R package. The results are visually represented in Figure 4.

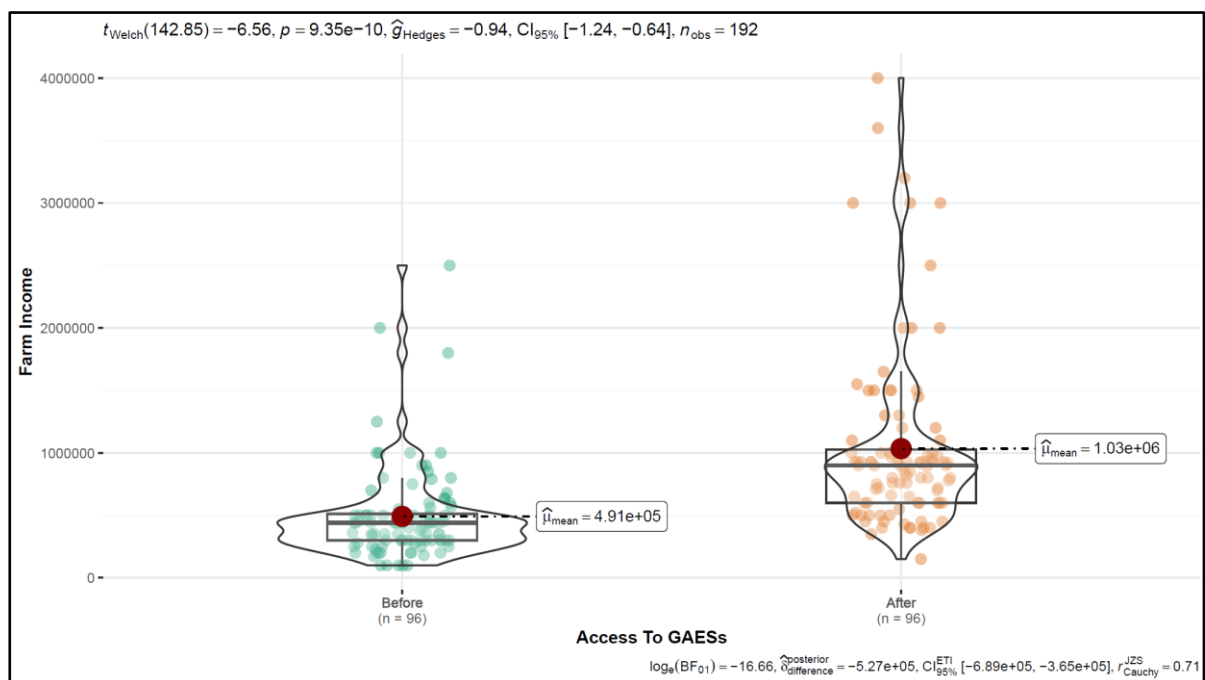


Figure 4: Comparison of incomes between farmers before and after accessing GAES.

From the figure, banana farmers were getting an average income of UGX. 491,354/= before accessing government agriculture extension services. After accessing GAESs, banana farmers were getting an average income of UGX. 1,034,146 /=. The difference is an additional UGX. 542,791/= as the effect of accessing GAESs, significant at 5% ($p < 0.001$). The difference is an additional UGX 542,791/= refers to the increase in income attributable to accessing GAESs. This means that, compared to their income before accessing these services (which can be inferred to be lower), farmers now earn UGX 542,791/= more on average because of the services received. The p-value of less than 0.001 means that there is less than a 0.1%

probability that the results occurred by random or chance. This indicates a very strong level of confidence in the conclusion that accessing GAESs has a meaningful and positive impact on the income of banana farmers.

This finding agrees with that of Danso-Abbeam et al. (2018) who stated that effective extension services can enhance farmers' skills and knowledge. This knowledge helps farmers to adopt improved agricultural practices which improve their productivity and efficiency, leading to higher yields and ultimately increased income. Additionally, having access to agricultural extension services often connects farmers with resources such as quality seeds, fertilizers, and modern farming equipment. By facilitating access to these inputs, farmers can enhance their production capabilities. This concurs with a study by Sahu et al. (2024) whose results revealed that farmers who received extension services were more likely to adopt improved agricultural technologies, which directly contributed to increased income. Also, extension services provide farmers with vital market information, including pricing, demand trends, and market access. This information enables farmers to make informed decisions about what agronomic practices increase banana productivity. This agrees with a study by Girma and Kuma (2022) which reaffirms that access to market information through extension services can lead to better pricing strategies and increased income for farmers. Furthermore, access to extension services helps farmers to understand and manage risks associated with banana production, such as climate variability and pest outbreaks. By providing training on risk management strategies, farmers can mitigate losses and maintain stable income levels. A study by Davis et al. (2012) highlighted that farmers who received extension support were better equipped to handle agricultural risks, leading to more consistent income. Also, access to agricultural extension services facilitates networking among farmers, researchers, and agricultural organizations. This collaboration can lead to shared resources, collective marketing efforts, and access to new technologies. As noted by Swanson and Rajalahti (2010), such networks can enhance farmers' bargaining power and improve their income prospects.

4.6. Strategies for improving the delivery of GAES.

The farmers were also asked for the different ways through which the income generated from bananas can be improved through the GAES. Their responses are summarized in Table 4.

Table 4: Strategies for improving the delivery of GAES.

Strategy	Farmers not accessing GAESs (N=69)	Farmers accessing GAESs (N=96)	Overall (N=165)	χ^2	p-value
Training/Sensitization workshops					
No	23 (33.3%)	24 (25.0%)	47 (28.5%)	30.552	<0.001
Yes	46 (66.7%)	72 (75.0%)	118 (71.5%)		
Provision of agro-inputs					
No	13 (18.8%)	22 (22.9%)	35 (21.2%)	54.697	<0.001
Yes	56 (81.2%)	74 (77.1%)	130 (78.8%)		
Subsidies for agro-inputs					
No	31 (44.9%)	24 (25.0%)	55 (33.3%)	18.333	<0.001
Yes	38 (55.1%)	72 (75.0%)	110 (66.7%)		
Market awareness and creation					
No	14 (20.3%)	23 (24.0%)	37 (22.4%)	50.188	<0.001
Yes	55 (79.7%)	73 (76.0%)	128 (77.6%)		
Farm visits					
No	35 (50.7%)	22 (22.9%)	57 (34.5%)	15.764	<0.001
Yes	34 (49.3%)	74 (77.1%)	108 (65.5%)		

Provision of agro-inputs to boost banana production in the area was ranked as the number one strategy (78.8%) that should be emphasized by the GAESs, with 77.1% and 81.2% of the banana farmers accessing and not accessing GAESs respectively, highly significant ($p < 0.001$). This 78.8% suggests that a significant majority of farmers believe that the provision of agro-inputs should be the primary focus of government agricultural extension services (GAESs). This indicates a strong consensus among farmers regarding the importance of these inputs for improving banana yields. The difference between two groups of banana farmers: those who have access to GAESs (77.1%) and those who do not (81.2%) indicate a slightly higher percentage among those not accessing GAESs suggests that they may feel a greater need for these inputs, possibly due to a lack of support. The p-value of less than 0.001 indicates that the differences observed between the two groups regarding their views on the importance of agro-inputs are statistically significant. This means there is a very low probability (less than 0.1%) that the observed differences occurred by chance, reinforcing the conclusion that access to GAESs influences farmers' perceptions of the importance of agro-inputs. This finding agrees with that of Swanson and Rajalahti (2010) that both farmers with and without access to GAESs recognize the importance of these inputs, and the statistical significance of the findings suggests that these perceptions are robust and meaningful.

Market awareness and creation by the GAESs was ranked second by 76% of those accessing and 79.7% of those not accessing the services. This is very important because it helps in price negotiation, which is very crucial in banana production in the study area. This finding is supported by the findings of Aderinto et al. (2017) and Benin et al. (2011). More than 70% of the banana farmers i.e., 75% (accessing) and 66.7% (not accessing) GAESs suggested being offered trainings on different banana production practices through the GAESs programs and this percentage is highly significant ($p < 0.001$). This percentage suggests a strong recognition among farmers of the need for education and skill development to improve their farming practices. The p-value of less than 0.001 means there is a very low probability (less than 0.1%) that the results occurred by chance, reinforcing the conclusion that a substantial majority of farmers strongly support the idea of receiving training through GAESs programs. The high significance level suggests that the need for training is a well-established concern among the farming community.

Farm visits were mentioned by 65.5% of the farmers. In connection to this, one farmer stated that; *“Trainings at demonstration sites is good but farm visits should be made by the extension agents. This is because each farm is unique and specific interventions may be needed at individual farms, which can only be achieved through farm visits.* This implies that training during workshops, seminars and field tours may not be enough. This is in agreement with the finding of Ganpat et al. (2017). In addition, individual farm visits can motivate farmers to work hard and put into practice what they have learned, and seek more information on some technical issues, all of which can significantly increase banana production hence farm income.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

This paper investigates the effect of accessing government agricultural extension services on the farm income generated from the sale of bananas in Lyantonde subcounty, Lyantonde district.

Starting from the first objective, more than half i.e., 58.1% of the banana farmers had access to GAES, with females (57.6%) accessing these services more than males (42.4%).

The logistic model to predict access to GAESs with nine (9) independent variables revealed that only two (2) factors i.e., access to agricultural credit and membership to farmers association were found to significantly influence access to GAES by the banana farmers in the study area. The other factors i.e., gender, age, education level, land size, household size, marital status, occupation and banana being a major source of income had no statistically significant influence on access to GAES in the study area.

The GAESs provided to farmers included - Planting materials (improved suckers), Agro-chemicals (fertilizers and pesticides), farm visits and trainings on various technologies and practices of improving banana production, with more than 50% reporting getting planting materials, farm visits and trainings.

Most importantly, it was found that having access to government agricultural extension services increased the banana farmers' farm income significantly at 5% when those accessing were compared with those not accessing the GAES – with an additional UGX. 203,380/=. The statistical analysis revealed that this increase is significant, suggesting a strong relationship between the availability of these services and higher income levels among the farmers.

When the farm incomes from the sale of banana before and after access, banana farmers were getting an average farm income of UGX. 491,354/= and UGX. 1,034,146 /= respectively, with a difference of UGX. 542,791/= as the effect of accessing GAES, significant at 5% ($p < 0.001$). This means that banana farmers, after accessing government agricultural extension services, achieved an average income of UGX 1,034,146/=. This represents an increase of UGX 542,791/= compared to their previous income, with strong statistical evidence

($p < 0.001$) confirming that this increase is not likely due to chance. This highlights the positive effect of GAESs on farmers' income.

Lastly, based on the opinion of the respondents, different ways through which the income generated from bananas can be improved through the GAES include but not limited to provision of agro-inputs to boost banana production; Market awareness and creation, more trainings on the banana production technologies and/or practices, and more farm visits for farm-specific solutions.

5.2. Conclusion

More than half of the banana farmers have access to government agricultural extension services and agricultural credit and are members of the banana farmers association. Only two factors, i.e., access to credit and membership to a farmer association were the only significant factors influencing access to government agricultural extension services. Most of the banana farmers accessing government agricultural extension services get more money than those not accessing the services, and the effect of accessing GAES significantly contributes to increased banana production, translating into increased farm incomes among the banana farmers in the study area.

5.3. Recommendations

First and foremost, training farmers in various sustainable banana production technologies and practices should be a primary focus for the government and development partners. Furthermore, it is essential to enhance the skills of extension agents by providing refresher or in-service courses on the latest banana production practices.

There is need to encourage formation and support of farmer associations since they were found to significantly influence access to GAES to ease dissemination of not only banana production knowledge and information but also other agricultural activities.

Finally, there is a need to provide agricultural credit with low interest rates, and transparency in selecting the beneficiaries of this credit should be a priority.

REFERENCES

- Abdallah, A.-H., & Abdul-Rahaman, A. (2016). Determinants of access to agricultural extension services: evidence from smallholder rural women in Northern Ghana. *Asian Journal of Agricultural Extension, Economics & Sociology*, 9(3), 1-8.
- Acharya, K. K., Malhotra, R., Sendhil, R., Mohanty, T., & Sahoo, B. (2022). Adoption of sustainable dairy management practices among peri-urban dairy farmers in Odisha. *Indian Journal of Extension Education*, 58(3), 120-125.
- Aderinto, A., Agbelemoge, A., & Dada, O. (2017). Effectiveness of extension service delivery and productivity of Cassava farmers in Southwestern Nigeria. *Journal of Agricultural Sciences*, 12(1).
- Alemu, T., Tolossa, D., Senbeta, F., & Zeleke, T. (2023). Household determinants of continued adoption of sustainable land management measures in central Ethiopia. *Heliyon*, 9(3).
- Ali, A., & Rahut, D. B. (2013). Impact of agricultural extension services on technology adoption and crops yield: Empirical evidence from Pakistan. *Asian Journal of Agriculture and Rural Development*, 3(11), 801-812.
- Amin, M. E. (2005). *Social science research: Conception, methodology and analysis*. Makerere University.
- Amrullah, E. R., Takeshita, H., & Tokuda, H. (2023). Impact of access to agricultural extension on the adoption of technology and farm income of smallholder farmers in Banten, Indonesia. *Journal of Agribusiness in Developing and Emerging Economies*.
- Anang, B. T., Bäckman, S., & Sipiläinen, T. (2020). Adoption and income effects of agricultural extension in northern Ghana. *Scientific African*, 7, e00219.
- Andersen, J. (2017). *Access to and benefit of agricultural extension in Tanzania a study from the Dodoma Region* Master Thesis University of Copenhagen (Denmark)].
- Atuhaire, A. M., Mugerwa, S., Kabirizi, J., Okello, S., & Kabi, F. (2014). Production characteristics of smallholder dairy farming in the Lake Victoria agro-ecological zone, Uganda. *Frontiers in Science*, 4(1), 12-19.
- Baloch, M. A., & Thapa, G. B. (2018). The effect of agricultural extension services: Date farmers' case in Balochistan, Pakistan. *Journal of the Saudi Society of Agricultural sciences*, 17(3), 282-289.
- Baruwadi, M. H., Akib, F. Y., & Bahua, M. I. (2020). Impact of agricultural extension performance on corn farmers household economy. *J. Austrian Soc. Agric. Econ*, 16, 137-146.
- Benin, S., Nkonya, E., Okecho, G., Randriamamonjy, J., Kato, E., Lubade, G., & Kyotalimye, M. (2011). Returns to spending on agricultural extension: the case of the National Agricultural Advisory Services (NAADS) program of Uganda. *Agricultural Economics*, 42(2), 249-267.
- Berhane, G., Ragasa, C., Abate, G. T., & Assefa, T. W. (2018). *The state of agricultural extension services in Ethiopia and their contribution to agricultural productivity*. Intl Food Policy Res Inst.

- Beshir, H., Emanu, B., Kassa, B., & Haji, J. (2012). Determinants of chemical fertilizer technology adoption in North eastern highlands of Ethiopia: the double hurdle approach. *Journal of Research in Economics and International Finance*, 1(2), 39-49.
- Bonou-Zin, R. D. C., Hinnou, L. C., Ayedoun, A. O., & Obossou, E. A. R. (2022). Impact of the agricultural advisory service on the productivity of maize and cotton in the cotton-growing zone of North Benin. *Journal of Agricultural Extension and Rural Development*, 14(3), 120-131.
- Bonye, S. Z., Alfred, K. B., & Jasaw, G. S. (2012). Promoting community-based extension agents as an alternative approach to formal agricultural extension service delivery in Northern Ghana. *Asian Journal of Agriculture and Rural Development*, 2(1), 76-95.
- Brenya, R., & Zhu, J. (2023). Agricultural extension and food security—The case of Uganda. *Global Food Security*, 36, 100678.
- Cawley, A., O'Donoghue, C., Heanue, K., Hilliard, R., & Sheehan, M. (2018). The impact of extension services on farm-level income: An instrumental variable approach to combat endogeneity concerns. *Applied Economic Perspectives and Policy*, 40(4), 585-612.
- Christoplos, I. (2010). Climate information and agricultural advisory services: a square peg in a round hole?
- Danso-Abbeam, G., Ehiakpor, D. S., & Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *Agriculture & Food Security*, 7(1), 1-10.
- Davis, K., Nkonya, E., Kato, E., Mekonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. *World development*, 40(2), 402-413.
- Elias, A., Nohmi, M., Yasunobu, K., & Ishida, A. (2013). Effect of agricultural extension program on smallholders' farm productivity: Evidence from three peasant associations in the highlands of Ethiopia. *Journal of Agricultural Science*, 5(8), 163.
- Elias, A., Nohmi, M., Yasunobu, K., & Ishida, A. (2016). Farmers' satisfaction with agricultural extension service and its influencing factors: a case study in North West Ethiopia. *Journal of Agricultural Science and Technology*, 18(1), 39-53.
- Emmanuel, D., Owusu-Sekyere, E., Owusu, V., & Jordaan, H. (2016). Impact of agricultural extension service on adoption of chemical fertilizer: Implications for rice productivity and development in Ghana. *NJAS-Wageningen Journal of Life Sciences*, 79, 41-49.
- Ganpat, W. G., Narine, L. K., & Harder, A. (2017). The impact of farm visits on farmers' satisfaction with extension: Examining the dependence on individual methods in the Caribbean. *Journal of International Agricultural and Extension Education*, 24(3), 20-35.
- Gathu, M. W. (2021). *Effect of Reduced Extension Services on Use of Productivity-enhancing Agricultural Inputs in Kenya* [University of Nairobi].
- Girma, Y., & Kuma, B. (2022). A meta analysis on the effect of agricultural extension on farmers' market participation in Ethiopia. *Journal of Agriculture and Food Research*, 7, 100253.

- Hasan, F., & Otsuki, T. (2011). Impact of Agricultural Extension on Productivity: Econometric Analysis Using Household Data in India.
- Khalid, S. M. N., & Sherzad, S. (2019). Agricultural extension manual for extension Workers.
- Kiconco, S., Stevens, J. B., Akankwasa, K., & Kubiriba, J. (2023). Agricultural information exchange and service delivery within social networks: Evidence from Uganda's banana value chain actors. *The Journal of Agricultural Education and Extension*, 29(5), 679-698.
- Lichtman, M. (2013). *Qualitative research for the social sciences*. SAGE publications.
- Lyantonde District Local Government. (2020). *Five-Year District Development Plan (DDPIII). Financial Year 2020/2021 - 2024/2025*. <https://lyantonde.go.ug/publications/statistics>
- Lyne, M. C., Jonas, N., & Ortmann, G. F. (2018). A quantitative assessment of an outsourced agricultural extension service in the Umzimkhulu District of KwaZulu-Natal, South Africa. *The Journal of Agricultural Education and Extension*, 24(1), 51-64.
- Mabaya, E., Waithaka, M., Tihanyi, K., Mugoya, M., Kanyenji, G., Ssebuliba, R., & Kyotalimye, M. (2021). Uganda Country Report 2020.
- Marlianti, N., Wahyunadi, I. H., & Harsono, I. (2017). The role of agricultural sector on the economy of West Nusa Tenggara (input-output analysis approach). *Jurnal Ekonomi dan Studi Pembangunan*, 9(2), 176-189.
- Mary, K., Kalibwani, R. M., & Benard, T. (2024). Factors Influencing Access of Government Agricultural Extension Services Among Banana Farmers in Lyantonde District, Uganda. *East African Journal of Agriculture and Biotechnology*, 7(1), 416-426.
- Masanja, I., Shausi, G. L., & Kalungwizi, V. J. (2023). Factors Influencing Rural Farmers' Access to Agricultural Extension Services Provided by Private Organizations in Kibondo District, Tanzania. *European Journal of Agriculture and Food Sciences*, 5(5), 115-122.
- Midamba, D. C., & Kizito, O. (2022). Determinants of access to trainings on post-harvest loss management among maize farmers in Uganda: a binary logistic regression approach. *Cogent Economics & Finance*, 10(1), 2148359.
- Miller, R. L. (2015). Rogers' innovation diffusion theory (1962, 1995). In *Information seeking behavior and technology adoption: Theories and trends* (pp. 261-274). IGI Global.
- Mohamed, K. S., & Temu, A. E. (2008). Access to credit and its effect on the adoption of agricultural technologies: the case of Zanzibar. *African Review of money finance and Banking*, 45-89.
- Mphepo, P., & Urassa, J. (2022). Contribution of Malawi's decentralized agricultural extension service system to farmers' maize productivity. *Tanzania Journal of Agricultural Sciences*, 21(2), 170-181.
- Nagar, A., Nauriyal, D. K., & Singh, S. (2021). Improving farmers access to agricultural extension services delivery systems: Lessons from a field study in western Uttar Pradesh, India. *Journal of Tropical Agriculture*, 59(2).

- O’Cathain, A., Murphy, E., & Nicholl, J. (2010). Three techniques for integrating data in mixed methods studies. *Bmj*, 341.
- Ogunniyi, L., Fanifosi, G., Ajao, O., & Dlamini, D. (2018). Impact of Agricultural Extension Services on Crop Farmers’ Productivity in Oyo State, Nigeria. *Applied Science Reports*, 23(3), 97-101.
- Olaleye, O., Adekunle, O., Adekunle, A., & Atieno, V. (2024). Bridging Gaps in Farmer Education: The Role of L3F in Fostering Human, Social and Financial Capital for Rural Development. *Journal of Developing Country Studies*, 8(1), 26-46.
- Onwuka, F. N., Otaokpukpu, J. N., & Okonkwo, C. J. (2017). Effectiveness of extension services in enhancing the productivity, income and welfare of women farmers cooperatives in Kajuru local government area of Kaduna State. *IIARD International Journal of Economics and Business Management*, 3(8), 86-100.
- Pan, Y., Smith, S. C., & Sulaiman, M. (2018). Agricultural extension and technology adoption for food security: Evidence from Uganda. *American Journal of Agricultural Economics*, 100(4), 1012-1031.
- R Core Team. (2024). *R: A Language and Environment for Statistical Computing*. . In R Foundation for Statistical Computing. <https://www.R-project.org/>
- Ragasa, C., Berhane, G., Tadesse, F., & Taffesse, A. S. (2013). Gender differences in access to extension services and agricultural productivity. *The Journal of Agricultural Education and Extension*, 19(5), 437-468.
- Ragasa, C., & Mazunda, J. (2018). The impact of agricultural extension services in the context of a heavily subsidized input system: The case of Malawi. *World development*, 105, 25-47.
- Rahman, M. M., & Connor, J. D. (2022). Impact of agricultural extension services on fertilizer use and farmers’ welfare: Evidence from Bangladesh. *Sustainability*, 14(15), 9385.
- Sahu, S., Bishnoi, S., Sharma, P. R., Satyapriya, Mahra, G. S., Burman, R. R., Barua, S., Misha Madhavan, M., Sangeetha, V., & Sinha, S. K. (2024). Exploring popular information sources and determinants of farmers’ access to agricultural extension services in the Indo-Gangetic plains. *Frontiers in Sustainable Food Systems*, 8, 1339243.
- Santos, J. A. (1999). Bank capital and equity investment regulations. *Journal of Banking & Finance*, 23(7), 1095-1120.
- Sennuga, S. O., Fadiji, T. O., & Thaddeus, H. (2020). Factors influencing adoption of improved agricultural technologies (IATs) among smallholder farmers in Kaduna State, Nigeria. *International Journal of Agricultural Education and Extension*, 6(2), 382-391.
- Shimali, F., Mangheni, M., & Kabahenda, M. (2016). Towards a new role of agricultural extension in nutrition education: evidence from western Uganda.
- Suvedi, M., Ghimire, R., & Kaplowitz, M. (2017). Farmers’ participation in extension programs and technology adoption in rural Nepal: a logistic regression analysis. *The Journal of Agricultural Education and Extension*, 23(4), 351-371.

- Swanson, B. E., & Rajalahti, R. (2010). Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems. *Agriculture and rural development discussion paper*, 45, 1-187.
- Teshager, A., Tsunekawa, A., Adgo, E., Haregeweyn, N., Nigussie, Z., Ayalew, Z., Elias, A., Molla, D., & Berihun, D. (2019). Exploring drivers of livelihood diversification and its effect on adoption of sustainable land management practices in the Upper Blue Nile Basin, Ethiopia. *Sustainability*, 11(10), 2991.
- Toraitich, C. J. (2021). *The Association Between Agricultural Extension Services and Food Security Among Small-Holder Farming Households in Uasin Gishu County, Kenya* University of Eldoret].
- WorldBank. (2021). Uganda Country Overview. In: World Bank Press: New York, NY, USA.

APPENDIX

Appendix I. Interview Schedule for the banana farmers.

HOUSEHOLD INTERVIEW SCHEDULE FOR BANANA FARMERS

My name is **Kyarisiima Mary** conducting academic research as a requirement for the award of a Master of Agriculture and Rural Innovations Bishop Stuart University. The objective of this study is - ***To explore the factors influencing access to Government Agricultural Extension Services (GAESs) as well as its effect on farm income among banana farmers in Lyantonde subcounty.*** In this study interview, your answers will not be released to anyone and will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. Your participation is voluntary, and you may choose to stop the interview at any time. ***Results will be shared with stakeholders for use and you upon request.***

Part A: Household Information

A1. Household Identification Information

Parish.....Subcounty:

A2: What is the size of your household? (i.e. number of all household members staying here and eating from the same pot for more than half of the year). *Eka yanyu neingana ki?.....*

A3: How many family members work; (i) only on the farm?(ii) only off the farm? *Ba memba b'eka abarikukora (i) omu faamu hoonka nibangahi? (ii) Hoonka hatari mu faamu?*

A4: Kindly share with us some information on the following (fill the table appropriately).

Gender	Age	Marital status	Education level*	Primary occupation
1 = Male	1 = Below 20 years	1 – Single	1 = No schooling	1 = Farming
0 = Female	2 = 20 – 30 years	2 = Married	2 = Primary	2 = Non-farming
	3 = 31 – 40 years	3 = Divorced	3 = Secondary	
	4 = 41 – 50 years	4 = Widowed	4 = College	
	5 = 51 – 60 years			
	6 = Over 60 years			

A5: What is the size of all the land managed by the household? Acres?
Eitaka ryoona eririkureebererwa eka niringana ki?

A6: (i) Is banana growing your main source of income? Yes ☐ No ☐
Okuhinga orutookye niyo ntasya yaawe nkuru?

(ii) If yes, how much on average, do you earn from your banana plantation annually?.....
Ku eraabe eriyo, omu orutookye rwawe nooyihamu nka zingahi buri mwaka?

(iii) How much do you earn from other farm activities?.....
Omu bindi ebyorikuhinga nooyihamu zingahi?

A7: (i) Did you obtain agricultural credit in the last 12 months? Yes ☐ No ☐
Okeguzaho sente z'eb'obuhingi omu meezi 12 agahweire?

(ii) If yes, state the person or institution you got this credit from, how much and the condition for getting this credit. *Hariho ekibiina ky'abahingi eky'orimu nainga ekigombe?*

Source (Tick, & write the name below) 1 = Farmer, 2 = Extension agent, 3 = Bank, 4 = Farmer associations.	Amount (UGX)	Condition for getting the credit. 1 = Mutual understanding 2 = Collateral (Land, equipment, or machinery)

A8: Do you belong to any farmer group or association? *Ori omukigombe kya bahingi?*

Yes ☐ No ☐

A9: Do men and women have equal opportunities to participate in these platforms/groups/associations? *Abashaija n'abakazi baine obugabe burikwingana okuza omu bibiina / bigombe ebi?*

Yes ☐ No ☐

A10: Have you attended any training/seminars/workshops on banana or crop production? *Hariho okutendekwa / emishomo y'orutookye / y'ebihingwa ei oraagiremu?*

Yes ☐ No ☐

Part B: Access to Government Agricultural Extension Services

B1: (i) Do you receive extension services from government extension workers? *Nootunga obuhabuzi kuruga aha buhereza bw'omu gavumenti y'eby'obuhingi omu kyaro?*

Yes ☐ No ☐

B2: (ii) If yes, who did you approach to access the extension services?

Ku eraabe ego, okehanuuzza ahary'oha kubutunga?

.....

B3: (ii) If No, Why? *Ku eraabe ingaaho, ahabw'enki?*

.....

B4: If you access extension services, which services do you get from the government extension workers? *Ku otunga obuhabuzi bw'okutungura eby'obuhingi omu kyaro, ni buhereza ki obu aba gavumenti barikukuha?*

.....

.....

.....

.....

Part C: Effect of accessing government agricultural extension services.

C1: (i) Have you realized an increase in banana production and hence farm income because of getting the services? *Waakireebire ku ebitookye hamwe n'entasya byeyongire omu bwingi ahabw'okutungura obuhereza obu?*

Yes ☐ No ☐

(ii) If yes, indicate the changes in farm income in the table below. *Ku kiraabe ego, yooreka empinduka omu byentasya ya faamu omu kishushani ekyakuheebwa ahaigo;*

Before accessing GAESs (otakatungire obuhereza)	After accessing GAESs (kuwaaherize kutunga obuhereza)

C2: Do you recommend those not accessing to look forward to accessing these GAESs?

Noohabura abatarikutunga obuhereza obu kugyezaho kuburonnda?

Yes ☐ No ☐

D4: What strategies should be put in place to improve the service delivery by the government extension workers in your area? *Ni ki ebi abahereza ba gavumenti b'ebyaro ahabw'entunguka y'eby'obuhingi bashemereire kuta omu mwanya kutungura obuhereza omu kyarokyaawe?*

.....
.....
.....

Thank you for the information provided and the time allowed for the interview!!!

Appendix II. Guide for Key Informant Interviews

INTERVIEW GUIDE FOR KEY INFORMANTS

My name is **Kyarisiima Mary** conducting academic research as a requirement for the award of a Master of Agriculture and Rural Innovations Bishop Stuart University. The objective of this study is - ***To explore the factors influencing access to Government Agricultural Extension Services (GAESs) as well as its effect on farm income among banana farmers in Lyantonde subcounty.*** In this study interview, your answers will not be released to anyone and will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. Your participation is voluntary, and you may choose to stop the interview at any time. ***Results will be shared with stakeholders for use and you upon request.***

1. How do you decide on the banana farmers to provide the extension services to?
Nobas'ota kusharamu ahabw'abahingi bebitookye kuhikibwaho okwegyesibwa?
2. How are the extension services packaged and made available to farmers? *Okwegyesibwa nikuba kuteekatekirwe kuta kandi nikuhikibwa kuta ahabahingi?*
3. What activities/methods do you use in providing these services (e.g., training, demonstration plots, exchange visits, media-posters, brochures, etc.)? *Ni mirimo ki/emiringo ey'orikukozesa omukuhikiriza obuhereza obu (nka okutendeka,emyanya y'okworekyeraho ,okutayayirana,ebirango byaha mikutu ,obutabo nebindi?)*
4. Are the extension services targeted at all family members or household heads? If aimed at household heads, how is the information shared with other members of the family? *Obuhereza bw'okwegyesibwa nibworekyerera aha bomuka boona ninga ahari b nyin'amaka?kuburabe nibworekyerera ahari ba nyin'amaka ,amakuru nigahika gata ahabandi abomuka?*
5. In your experience, is it more successful to extend services to household heads or all family members? Under which circumstances is it successful? *Omubukugu bwawe, nekyobusinguzi kuhisya obuhereza ahari ba nyinamaka ninga abomuka boona? Ni mumbeera ki obukiriba ekyobusinguzi?*
6. Who conducts the extension activities (e.g., government extension workers only or there are other partners involved)? *Nooha orikukora emirimo yokutwara obwegyese (nka abekitongore kyobwebembezi bweihanga bonka narishi hariho abandi abarikwegeitaho)?*
7. Do you have any framework for monitoring the effect of providing the services to the banana farmers? *Oineho entebekanisa yoona erikukora omukurebuuza ebirikorwaho omukuhitsya obuhereza ahabahingi bebitookye?*
8. How do you link with the other NGOs and/or private sectors in activities related to the diffusion of practices or technologies geared towards increasing banana productivity? *Nokoragana ota nebindi bitongore ebitari byobutegyeki byeihanga kandi nebyabantu buntu omu mirimo yokukora ningashi enkora ya karimagyezi eyorekyereire okwongyera obuhingi bwebitookye omukicweka eki?*
9. Do you think the provision of extension services has had significant effect on banana productivity and farmers income generated from banana growing? *Notekatekaki ngu okuhitsya obuhereza bwokegyesa heine ekikiteireho ahabuhingi bwebittokye nahantasya yabahingi erikuruga omukuhinga ebitookye?*
10. What recommendations would you give to improve the extension services geared towards increasing banana productivity in this area? *Okahereza buhabuzi ki ahakwongyera omutindo gwokuhitsya obwegyese kyorekyereire okukanyisa obuhingi bwebitookye omu ki cweeka eki?*

Thank you for your time!!!