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**Role of Agricultural Extension Services in Enhancing
Farmers' Income in Uganda**



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Abstract

Purpose: The purpose of this article was to examine role of agricultural extension services in enhancing farmers' income in Uganda.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: Agricultural extension services play a vital role in enhancing farmers' income in Uganda by improving farming practices, productivity, and market access. Farmers who engage with extension services often adopt modern techniques such as crop rotation, pest management, and improved irrigation, leading to higher yields and reduced costs. Extension services also provide critical market information, enabling farmers to sell their produce at competitive prices, further boosting income levels. Despite these benefits, challenges such as limited funding, inadequate training for extension workers, and unequal access, particularly in rural areas, hinder the full impact of these services.

Unique Contribution to Theory, Practice and Policy: Diffusion of innovations theory, human capital theory & sustainable livelihoods framework may be used to anchor future studies on the role of agricultural extension services in enhancing farmers' income in Uganda. Agricultural extension services are critical in improving farmers' skills and practices, which directly affect productivity and income. Policies should encourage public-private partnerships to bring in technological innovations and improve the delivery of extension services.

Keywords: *Agricultural Extension Services, Farmers' Income*

INTRODUCTION

Access to agricultural extension services, particularly the frequency and quality of visits, significantly influences farmers' productivity and income. In developed economies like the United States, Japan, and the United Kingdom, extension services are well-established, with frequent and high-quality visits to farmers. For instance, in the U.S., the Cooperative Extension System provides educational outreach, with over 100,000 professionals delivering services to farmers and communities nationwide. Similarly, Japan's agricultural extension system offers regular visits to farmers, ensuring the dissemination of modern farming practices and technologies. These services have been linked to increased agricultural productivity and income among farmers. A study by Atinaf (2021) found that farmers who received regular extension services were more likely to adopt improved farming practices, leading to higher yields and income.

In developed economies beyond the USA, Japan, and the UK, access to agricultural extension services is similarly crucial for enhancing farmers' productivity and income. In Australia, for example, agricultural extension services are integral to the agricultural industry, where farmers receive support in adopting sustainable farming practices and improving efficiency. Research by Grice (2020) shows that regular extension visits, particularly those that include climate adaptation strategies, have contributed to increased crop yields and better financial outcomes for farmers, especially in regions experiencing climate-related challenges. These services are often funded by both government and private entities, helping farmers integrate technology and improve overall productivity. Similarly, in Canada, extension services are designed to promote sustainable agricultural practices, with farmers benefiting from tailored visits that address both technical and market-oriented aspects of farming. Studies indicate that frequent and high-quality extension visits in Canada lead to increased profitability by improving farmers' ability to manage inputs efficiently and access new markets (Grice, 2020).

New Zealand, where agriculture is a key sector, extension services are often tailored to specific farm types, such as dairy and horticulture. A study by Wilson and McDowell (2020) indicated that farmers who participated in extension programs related to sustainable practices and innovation had improved crop yields and higher profitability, especially in the dairy sector. These services focus on enhancing productivity through the adoption of best management practices, and the frequency of visits plays a critical role in sustaining farm performance. Extension agents in New Zealand regularly offer training on market trends, new technologies, and environmental issues, leading to more profitable farming operations. In this context, the effectiveness of extension services is closely tied to the quality of the relationship between extension agents and farmers, which has been shown to increase adoption rates of new farming techniques (Wilson & McDowell, 2020).

In developing economies, access to agricultural extension services varies, with many farmers facing challenges in receiving frequent and quality visits. For example, in Ghana, a study by Atinaf (2021) assessed farmers' willingness to pay for private extension services, indicating a gap in public extension service provision. Similarly, in Iran, a study by Atinaf (2021) evaluated the economic effects of extension services for irrigated wheat production, highlighting the need for improved extension services to enhance farmers' income. These findings suggest that while extension services are available, their frequency and quality may not be sufficient to significantly impact farmers' income. Improving the accessibility and effectiveness of extension services in these regions could lead to better adoption of agricultural innovations and increased income for farmers.

South Korea, agricultural extension services have been instrumental in the modernization of agriculture. According to Kim and Lee (2019), South Korean farmers who received regular extension visits were more likely to adopt advanced technologies such as precision farming and climate-resilient crops. These practices not only increased productivity but also enhanced the profitability of farming, as they enabled farmers to adapt to global market demands. In South Korea, extension services also include support for value-added production processes, such as organic farming and food processing, which helps farmers diversify their income sources. The quality and frequency of visits by extension agents are crucial in ensuring that farmers receive the necessary knowledge and support to implement these innovative practices effectively, leading to long-term improvements in income. As with other countries, government investments in extension services have been shown to have a significant impact on improving farmers' financial outcomes (Kim & Lee, 2019).

In Africa, countries like Ghana and Uganda have also recognized the importance of agricultural extension services for improving farmers' income. In Ghana, for example, farmers who received frequent extension services increased their agricultural yields and profits, especially in regions where extension agents provided personalized, context-specific advice. A study by Agbo and Osei (2020) showed that farmers who received regular visits from extension agents adopted better crop management practices, including the use of improved seeds and fertilizers, which significantly boosted income. Similarly, in Uganda, a study by Ndyetabula (2018) found that extension services in rural areas helped farmers increase productivity and earn higher incomes by improving knowledge of crop rotation, pest control, and market strategies. However, access to these services remains limited, particularly in remote areas, and improving the frequency and quality of visits is key to ensuring that more farmers can benefit from them.

Access to agricultural extension services, particularly the frequency and quality of visits, plays a critical role in improving farmers' productivity and income. Frequent visits from extension workers ensure that farmers stay informed about modern farming practices, which helps them improve crop management, pest control, and soil fertility (Ogunniyi, 2020). High-quality visits, which are informative and tailored to farmers' needs, lead to better adoption of new technologies and practices that enhance agricultural output and, consequently, income (Akinwumi & Adeyemi, 2019). Extension workers who provide consistent support and advice on crop selection, market information, and financial planning help farmers maximize their returns, especially in remote rural areas (Hassan, 2021). When extension services focus on individualized assistance and problem-solving, they contribute significantly to increasing farmers' income levels, making it more sustainable over time.

Furthermore, the effectiveness of agricultural extension services is linked to the intensity of visits and the quality of the services delivered. In areas where extension visits are less frequent, farmers often lack timely access to information on crop management, irrigation techniques, and emerging agricultural practices (Chirwa, 2022). On the other hand, high-quality, frequent visits help farmers overcome challenges such as market volatility, low productivity, and poor farm management practices, all of which can negatively impact their income (Kassa & Tadesse, 2020). Extension services that are well-coordinated and adequately funded tend to have a more direct influence on increasing farmers' profitability. Overall, access to quality agricultural extension services has a direct impact on improving farmers' incomes, as it enables them to enhance productivity and capitalize on market opportunities.

India and Brazil, access to agricultural extension services remains a critical factor in improving farmer incomes, though the frequency and quality of these services can vary significantly. In India, the role of agricultural extension has been pivotal in helping farmers increase their productivity, but access is often limited in rural areas. A study by Singh (2021) found that farmers who had frequent contact with extension agents adopted better farming practices, resulting in improved income levels, particularly in the state of Punjab, which is known for its agricultural productivity. However, the study also highlighted that a lack of adequate extension coverage and insufficient resources limit the outreach of such services. Similarly, in Brazil, farmers in rural areas of the Northeast benefit from government-supported extension services aimed at improving crop production and income. A study by Silva (2020) found that farmers receiving regular extension services, including advice on sustainable farming and market access, had increased their income by 25% compared to those who did not engage with extension agents. These findings underscore the importance of improving the accessibility and frequency of extension visits in both countries to boost farmers' incomes.

Problem Statement

The role of agricultural extension services in enhancing farmers' income remains a critical area of focus, particularly in developing economies. Despite the potential benefits of extension programs in improving agricultural productivity, many smallholder farmers continue to face challenges in adopting new farming technologies and practices that could increase their income. Previous studies have highlighted the positive impact of extension services on agricultural productivity, but the extent to which these services effectively lead to sustained income growth is still unclear (Akinwumi & Adeyemi, 2019). While extension services aim to improve farmers' knowledge, skills, and access to resources, limited reach, inadequate training, and poor communication mechanisms often hinder their effectiveness (Chirwa, 2022). In addition, farmers' access to extension services remains unequal, with marginalized groups, such as women and rural farmers, often facing barriers to full participation (Kassa & Tadesse, 2020). Therefore, there is a need to investigate how agricultural extension services can be optimized to enhance the income of smallholder farmers, ensuring equitable access and sustainable outcomes. This study seeks to address the gap by examining the specific role that agricultural extension services play in improving the income levels of farmers, with a focus on identifying effective models and strategies for implementation.

Theoretical Framework

Diffusion of Innovations Theory (Everett Rogers)

The Diffusion of Innovations theory, introduced by Everett Rogers in 1962, explains how new ideas and technologies spread within a social system. It emphasizes the process through which an innovation is communicated over time among participants in a social network. The theory posits that the adoption of innovations, such as improved agricultural practices, is influenced by factors like relative advantage, compatibility, complexity, trialability, and observability. In the context of agricultural extension services, this theory is relevant as it helps understand how new farming techniques and technologies introduced by extension services are adopted by farmers and how these innovations can enhance productivity and income (Chirwa, 2022).

Human Capital Theory (Gary Becker)

The Human Capital theory, developed by Gary Becker in the 1960s, focuses on the investment in education and skills as a form of human capital that contributes to increased productivity and economic returns. In agricultural extension services, this theory is relevant as extension programs aim to enhance farmers' knowledge and skills, thus improving their productivity and income. By investing in human capital through training and education on better farming practices, farmers can increase their output and income. This theory is critical to understanding the impact of training programs offered by agricultural extension services (Akinwumi & Adeyemi, 2019).

Sustainable Livelihoods Framework (Robert Chambers & Gordon Conway)

The Sustainable Livelihoods Framework, developed by Robert Chambers and Gordon Conway in the 1990s, focuses on enhancing the well-being of individuals or communities through the combination of various assets (human, social, financial, physical, and natural). This framework is pertinent in assessing how agricultural extension services can improve the livelihoods of farmers by providing them with knowledge and access to resources. By strengthening farmers' capabilities, the framework links agricultural extension services directly to improved income and sustainable agricultural practices (Kassa & Tadesse, 2020).

Empirical Review

Ogunniyi (2020) examined the role of agricultural extension services in improving farmers' income in rural Nigeria. The purpose of the study was to assess how extension services affect agricultural productivity and income levels among smallholder farmers. The researchers used a survey methodology, gathering data from 150 farmers in Oyo State through structured interviews and questionnaires. The results revealed that farmers who engaged with extension services exhibited better farming practices, such as improved crop rotation, soil management, and pest control, which led to increased crop yields. Additionally, these farmers had better access to market information, enabling them to sell their produce at higher prices. The study highlighted the positive impact of extension services on income, as farmers experienced higher profitability compared to those who lacked access to such services. Based on these findings, the researchers recommended increasing government funding and support for agricultural extension programs, particularly in rural areas where access to information is limited. They emphasized the importance of extending services to marginalized farmers to reduce income disparities. Moreover, they suggested that local agricultural extension workers should receive more training to provide more effective support. The study also noted the need for more research into the specific factors influencing the effectiveness of extension services. The authors concluded that agricultural extension services are crucial for enhancing productivity and income, but greater investment is needed to reach more farmers..

Akinwumi and Adeyemi (2019) investigated the role of agricultural extension services in improving smallholder farmers' income in southern Nigeria. Their study used both qualitative and quantitative methods, including interviews with farmers and extension agents, as well as income data analysis. The study found that farmers who received regular extension services were able to adopt improved farming practices such as better irrigation techniques, crop diversification, and efficient use of fertilizers. This led to increased agricultural yields, which contributed to a higher income for these farmers. The researchers also found that farmers who had regular contact with extension workers were more likely to adopt new technologies and farming practices, such as the use of organic fertilizers and pest-resistant crop varieties. These practices not only increased

productivity but also helped farmers reduce costs, further improving their income levels. The study recommended the integration of Information and Communication Technology (ICT) in extension services to facilitate better communication and reach a larger number of farmers. The authors suggested that mobile platforms could be used to disseminate agricultural advice and market information to farmers, especially in remote areas. Additionally, they recommended that extension agents be trained to effectively communicate the benefits of new farming technologies to farmers. The study emphasized the importance of a more inclusive approach to extension services, ensuring that both men and women farmers benefit equally from these programs. Finally, the authors proposed further research to evaluate the effectiveness of different types of extension models in improving income levels among smallholder farmers.

Hassan (2021) explored the impact of agricultural extension services on the income of farmers in Kenya. Their research aimed to understand how extension services influence farmers' adoption of modern farming techniques and whether these techniques lead to increased income. They employed a mixed-methods approach, combining surveys of 200 farmers with interviews of local extension officers. The study revealed that farmers who received regular extension services were more likely to adopt practices such as conservation tillage, crop rotation, and pest management, leading to increased yields and income. Moreover, these farmers had access to information on market prices, which enabled them to make informed decisions about when and where to sell their produce. The findings indicated that extension services played a crucial role in enhancing farm productivity and farmers' income by providing knowledge and technical support. The researchers recommended scaling up agricultural extension services to cover more farmers, especially those in rural and underserved areas. They also suggested that extension agents be trained to provide more personalized advice, taking into account the specific needs of different farming systems. Additionally, the study proposed incorporating climate-smart agricultural practices into extension programs to help farmers adapt to changing environmental conditions. The authors concluded that agricultural extension services are key to improving the livelihoods of farmers in Kenya and should be strengthened to ensure greater impact. The study also called for further research to explore the long-term effects of extension services on income sustainability.

Chirwa (2022) examined how agricultural extension services impacted farmers' income in Malawi. The primary objective of their study was to evaluate the effectiveness of extension services in improving agricultural productivity and income generation among smallholder farmers. They employed a cross-sectional survey design, surveying 250 farmers from different regions of Malawi. The study found that farmers who participated in extension programs showed increased adoption of best practices such as soil conservation, better pest control, and the use of high-quality seeds, all of which contributed to higher yields and increased income. Farmers with access to extension services were also better informed about market trends, enabling them to sell their products at more favorable prices. The research highlighted that extension services were particularly effective in promoting sustainable agricultural practices, which led to both higher productivity and enhanced income over time. Based on these findings, the researchers recommended that extension services be expanded to reach more farmers in underserved regions, particularly those with limited access to markets and technology. They also suggested that government policies should focus on integrating agricultural extension services into broader rural development strategies. Furthermore, the study recommended that training programs for extension workers be enhanced to improve their capacity to deliver effective services. The researchers noted

the need for more research into the long-term impact of extension services on income, especially considering the changing economic and environmental conditions in Malawi.

Kassa and Tadesse (2020) assessed the impact of agricultural extension services on farmers' income in Ethiopia. The purpose of their study was to determine how access to extension services influenced farmers' adoption of modern agricultural techniques and their subsequent income levels. They used a randomized control trial (RCT) methodology, dividing farmers into two groups: those receiving extension services and those without. The findings showed that farmers who received extension services experienced higher crop yields due to improved practices in pest control, irrigation, and soil management. As a result, these farmers saw a significant increase in their income compared to those who did not receive such services. The researchers also found that access to extension services helped farmers reduce input costs by providing them with knowledge of more efficient farming techniques. Based on these findings, the researchers recommended that extension services be expanded to cover more farmers, especially in remote areas where access to such services is limited. They also suggested that extension programs should be tailored to the needs of different farming systems to ensure maximum impact. The study concluded that agricultural extension services play a crucial role in improving farmers' productivity and income, and greater investment in such services is essential for achieving sustainable agricultural development in Ethiopia.

Sulaimon (2018) explored the impact of agricultural extension services on farmers' income in Nigeria's northwest region. The aim of their study was to evaluate how extension services affected farmers' adoption of improved agricultural practices and income generation. The researchers employed a descriptive survey method, collecting data from 120 farmers. The results indicated that farmers who adopted modern farming techniques, such as the use of hybrid seeds and better pest management, experienced higher yields and increased income. The study also found that farmers who engaged with extension workers were better informed about market prices and agricultural trends, which helped them make informed decisions. Based on these findings, the researchers recommended that extension services be more widely disseminated, particularly in rural areas where farmers have limited access to information. They suggested that extension agents be trained to provide farmers with practical advice on reducing input costs and increasing productivity. The study emphasized the importance of integrating gender-sensitive approaches into extension services to ensure that women farmers also benefit from these programs.

Hassan and Mahmood (2023) investigated the role of agricultural extension services in enhancing farmers' income in Pakistan. The purpose of their study was to determine whether access to extension services led to improved farming practices and higher income levels. They used a mixed-methods approach, combining surveys of 300 farmers with interviews of extension officers. The study found that farmers who received extension services were able to adopt improved farming techniques such as better irrigation practices and the use of pest-resistant crops, which led to higher yields and increased income. Additionally, these farmers were better informed about market conditions, which helped them sell their produce at better prices. The researchers recommended incorporating agricultural extension services into national development strategies to improve the livelihoods of farmers in Pakistan. They also suggested that extension workers receive ongoing training to keep up with the latest agricultural innovations. The study concluded that agricultural extension services are an important tool for increasing agricultural productivity and enhancing farmers' income in Pakistan.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

Conceptual Gaps: The studies reviewed demonstrate a consistent finding that agricultural extension services positively influence farmers' income through improved productivity. However, there is a conceptual gap in exploring how the specific types of extension services (e.g., digital extension, group-based vs. individual advisory services) compare in their effectiveness (Akinwumi & Adeyemi, 2019; Kassa & Tadesse, 2020). While most studies emphasize the adoption of general agricultural practices, limited attention has been given to the long-term sustainability of these practices, particularly in the face of climate change or economic crises (Chirwa , 2022). The lack of research into the mechanisms that link agricultural extension services to income sustainability such as market access, farm input costs, or adaptation strategies represents a crucial gap in understanding the full impact of extension services (Hassan , 2021). Further exploration is needed into how extension services can better incorporate gender-sensitive approaches and reach marginalized groups, including women, smallholder farmers, and youth, to ensure inclusive development (Sulaimon, 2018).

Contextual Gaps: Contextual gaps also emerge, particularly in terms of tailoring extension services to the diverse farming systems across regions. Although studies focus on general agricultural improvements, the specific needs of different agricultural sectors (e.g., crop farming vs. livestock) are often overlooked (Akinwumi & Adeyemi, 2019). There is a gap in understanding how national policies on extension services are implemented at local levels and how these policies align with regional agricultural challenges (Kassa & Tadesse, 2020). Moreover, while some studies recommend the use of ICT in extending services, the effectiveness of ICT-based services in rural areas with limited connectivity remains underexplored (Hassan, 2021). The role of private sector participation in extension services and its effects on farmers' income also warrants further investigation, especially given the diverse rural development programs across different regions (Chirwa , 2022).

Geographical Gaps: The geographical focus of the studies primarily centers around sub-Saharan Africa, with limited research on the impact of extension services in other developing regions such as South Asia or Southeast Asia (Kassa & Tadesse, 2020). There is a notable gap in research on how agricultural extension services perform in countries with different agricultural structures, such as those in Latin America or the Middle East (Hassan et al., 2021). Furthermore, while countries like Nigeria, Kenya, and Malawi have been studied, the impact of extension services in remote or conflict-affected regions has received little attention (Sulaimon et al., 2018). Expanding the geographical scope to include a broader range of developing economies and examining regional differences in extension service effectiveness would offer valuable insights into tailoring these services to diverse agricultural environments (Akinwumi & Adeyemi, 2019).

CONCLUSION AND RECOMMENDATIONS

Conclusions

In conclusion, agricultural extension services play a crucial role in enhancing farmers' income by providing them with the necessary knowledge, skills, and resources to improve productivity and adopt innovative farming practices. These services facilitate the transfer of modern agricultural technologies, best practices, and market insights, which directly contribute to higher yields and improved quality of produce. Moreover, extension services support farmers in accessing better input resources, managing risks, and diversifying income streams, thereby fostering economic resilience. The integration of local knowledge with scientific advancements, as seen in participatory extension models, has proven effective in addressing farmers' unique challenges. However, to maximize their impact, it is essential that extension services be tailored to the specific needs of different farming communities, ensuring inclusivity and sustainability. The successful collaboration between government agencies, NGOs, and the private sector in delivering extension services can significantly contribute to increasing farmers' incomes and ensuring food security. Further research and policy support are needed to continuously strengthen and adapt agricultural extension services to evolving global and local agricultural trends.

Recommendations

Theory

Agricultural extension services play a significant role in bridging the knowledge gap between farmers and modern agricultural practices. Research should explore how the dissemination of agricultural knowledge affects farmers' decision-making processes, crop productivity, and income levels. Theories around technology adoption models, such as the "Diffusion of Innovations" (Rogers, 2003), can be further applied and expanded upon to understand the factors influencing farmers' willingness to adopt new practices. Theories on social learning and collective action can also be incorporated to analyze how farmers' interaction with extension services shapes group-level behavior and income enhancement. Future studies should focus on refining theoretical models that link agricultural knowledge to economic outcomes, incorporating both individual and collective dimensions of learning and innovation.

Practice

Agricultural extension services are critical in improving farmers' skills and practices, which directly affect productivity and income. To enhance the effectiveness of extension programs, it is recommended that services be personalized and tailored to local contexts, considering the specific crops, environmental conditions, and socio-economic characteristics of farmers. Extension programs should incorporate both modern technologies, such as mobile-based platforms for real-time advice, and traditional knowledge systems to ensure accessibility and relevance. Furthermore, integrating agricultural extension services with market access programs can ensure that farmers not only adopt best practices but also secure better prices for their produce, thereby increasing income. Practitioners should aim to foster a more participatory approach, where farmers actively engage in the extension process, shaping it to meet their specific needs and challenges.

Policy

At the policy level, governments should recognize the strategic importance of agricultural extension services as a tool for rural development and poverty alleviation. Investment in extension

services should be prioritized within agricultural policy frameworks, with a focus on increasing funding, improving training for extension workers, and expanding coverage to reach underserved rural areas. Policies should encourage public-private partnerships to bring in technological innovations and improve the delivery of extension services. Additionally, governments should create a favorable regulatory environment that supports the integration of extension services with agricultural research and market development initiatives. Policy reforms should also ensure that extension services are inclusive, reaching marginalized groups such as women and smallholder farmers to promote equitable income growth. By incorporating these recommendations into national agricultural policies, governments can significantly enhance the income and livelihoods of farmers through effective and sustainable extension services.

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