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EVALUATING THE IMPACT OF AGRICULTURAL EXTENSION SERVICES ON GROUNDNUT PRODUCTION IN ZAMBIA: A CASE STUDY ON MPIKA DISTRICT

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ABSTRACT

Groundnut is one of tile dominant crops in Zambia that enable most of smallholder farmers earn both food and income. Despite the overall importance of the crop amongst farmers in the country; its productivity countrywide is often hampered by a number of limitations. The study will be guided by the following objectives i).to assess the current utilization of agricultural extension services by groundnut farmers in the Mpika District. ii). Identify the perceived benefits and challenges associated with extension services for groundnut production.iii). To investigate the impact of extension services on groundnut yield, adoption of improved practices, and overall farm productivity. The study will employ a mixed- methods approach, including both quantitative and qualitative data collection with the help of Survey-questionnaires it will administer structured questionnaires to groundnut farmers in the Mpika District. Collect data on extension service utilization, crop management practices, and socio-economic factors. Further conduct a Focus Group Discussions with farmers, extension workers, and local stakeholders. Explore perceptions, challenges, and experiences related to extension services. Quantitative data will be analyzed using descriptive statistics, regression models, and impact assessment techniques. Qualitative data from FGDs will be thematically analyzed. This study contributes to the broader understanding of how extension services can drive agricultural development. Findings will guide policymakers, extension agencies, and development partners in designing targeted interventions that empower farmers, improve livelihoods, and promote sustainable groundnut production in Zambia.

Keywords: Agriculture Extension, Groundnut, Production.

I. INTRODUCTION

1.1 Overview

This chapter introduces the study. It describes the background of the study, the statement of the problem, the purpose of the study, objectives, research questions, significance of the study.

1.1 Background

For many years, the agricultural sector, like the rest of the economy in general, operated under a controlled policy environment. The past agricultural policies were characterised by excessive government intervention and control. Economic management was mainly through state institutions using various instruments, such as agricultural input and marketing subsidies, foreign exchange controls, and controls on interest rates. Revenue, mainly from the pre-1975 copper boom, was used to invest heavily in the parastatal firms and high tariffs and import licensing ensured their protection. Inevitably, this stifled private investment in productive sectors and retarded the development of the agricultural sector that became entirely dependent upon an increasingly inefficient public sector. At the close of the Second Republic in Zambia, in the wake of dismal agricultural performance, serious economic reforms were undertaken that continue to have a profound effect on most of the economy. The liberalization of the agricultural sector (1991) included the near total retreat of government from its previously primal role in every aspect, from the inputs markets to final retailing. Most of the agricultural sector was unprepared for the consequences of this rapid shift to a market economy. Because of the abrupt retreat of government without the concurrent creation of new support systems, agriculture has been left in an institutional vacuum. Government institutions that provided critical market functions closed or, in some cases, were privatized. Extension workers that supported farm production were no longer available as a free public service

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The Food and Agricultural Organization projected the world population to reach 9 billion by 2050. Sub-Saharan Africa (SSA) has the fastest growing population and rate of urbanization globally, according to the United Nations Department of Economic and Social Affairs (UNDESA). The increasing population will also require more food production. However, the increasing impact of urbanization, rural–urban migration, climate change, and poverty poses a challenge to food production . Agricultural extension is critical to improving agricultural production, adaptation to climate change, poverty reduction, and food security.

Agricultural extension is a significant determinant that helps agricultural value chain actors such as farmers increase agricultural productivity, thereby improving income, alleviating poverty and enhancing food security. Empirical studies have shown that agricultural extension training is significant in agronomic practices, diet diversification and nutrition, sustainable agriculture, achieving sustainable development goals (no poverty) and 2 (zero hunger, improving food security, and adopting advanced technologies. The provision of agricultural services must adapt to the changing social, economic, and environmental indicators affecting the entire food system from production to consumption

This study defines agricultural extension services (also referred to as agricultural advisory services) as the complete composition of organizational structures that facilitates and engages people in agricultural production, marketing, processing, and consumption and builds the capacity to improve their livelihoods. Agricultural extension is essential in both the urban and rural agricultural value chain as a critical link for capacity building. The entire agricultural value chain requires information and technology flow, and agricultural extension could contribute to the sustainability of urban–rural linkages. Additionally, according to International Food Policy Research Institute (IFPRI), it contributes to the attainment of sustainable development goals (SDGs), specifically, SDGs 1 (no poverty), 2 (end hunger), 12 (sustainable production and consumption), (climate change), 14 (life below water), and 15 (life on land). Both rural and urban agriculture are essential contributors to the food system . Although urban agriculture is not a substitute for rural agriculture, it contributes to and supplements the environmental and human well-being in urban centers .

Delivering an excellent performance in agricultural extension services has been problematic due to rapid farming challenges and the historical setup of public agricultural extension services. Public extension services have resulted in poor political and financial resources support. Consequently, this has affected the sustainability of extension services in most developing countries, especially where donor support is limited. It has been challenging to show the impact of extension in SSA because of the different models of extension and mixed evidence. The extension system in developing countries functioned poorly in achieving its purpose and requires attention. Other scholars have argued that weak performance also results from the top-down approach that might not work accurately in areas that are distant to monitor, and accountability tends to be poor.

Private agricultural extension services are an alternative to the public service system . However, the private sector has used extension service delivery as a marketing tool, and they are more skewed to high-value agricultural services. Notably, the public agricultural extension still has a significant role to play, e.g., where externalities for information and public goods are high, such as environmental and conservation concerns, and the inclusion of disadvantaged groups, such as women who are significantly contributing to agricultural production. In assessing the gender gap in agricultural extension services in Ghana, Quaye et al. indicate that specially targeted services are important for women in agriculture.

Several agricultural extension methods include the participatory approach, farmer field schools approach, training and visit approach, and farmer-to-farmer approach. With the increasing use of and access to approaches based on information communication and technology (ICT), televisions, radios, and phones are used to complement the traditional extension methods. Pluralistic and participatory approaches focusing on facilitation (group formation) and technology (market access) use should perfectly complement SSA. Kalusopa finds that poor infrastructure and an unclear policy framework environment for using technology for agricultural extension service delivery to small-scale farmers in Zambia is challenging.Generally, agriculture budgets significantly affect the effectiveness of agricultural extension, especially in building their capacity, but the funding has been significantly reduced. Literature has revealed that the capacity, such as resources, skills, efficiency, and extension staff, is lacking. Moreover, the tertiary education system has not coped with the social, economic, and environmental needs of the required workforce, which is equally important. African countries

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agreed upon the improvement of the budget allocation to at least 10% of their national budget to agriculture for 5 year. The progress on financial allocation to agriculture through the Comprehensive African Agricultural Development Programme framework has been unsatisfactory. Africa and the sub-regions, on average, failed to meet the set target. Only a few countries managed to achieve the target in one or more fiscal years but not in every year from 2003 to 2015 . Of the 55 African Union countries, only 7 passed the 10% allocation for most years (Burkina Faso, Ethiopia, Guinea, Malawi, Mali, Niger, and Senegal). The most significant portion of the expenditure is on agricultural subsidies, whereas agricultural extension and research were lower in most countries.

Empirically, agricultural extension service performance is mostly assessed at an impact level, such as production, yield, and farmer's profit margins, and not at a process level. Birner et al. contend that from an analytical perspective, measuring performance is more practical and less demanding than assessing impact. Furthermore, the study contributes to the comparative studies of the pluralistic agricultural extension service performance that is less explored in the literature. Specifically, we focus on pluralistic agricultural extension services using PEA in the Ministry of Food and Agriculture (MoFA), Ghana and the Ministry of Agriculture (MoA), Zambia. The pluralistic agricultural extension is the integrated approach to extension through different extension providers to farmers, such as the government, private sector, non- governmental organization and farmer-based community groups, such as cooperatives.

1.2 Statement of the Problem

Groundnut (Arachis hypogaea L.) is a leguminous crop with significant agricultural importance. It is cultivated for its edible seeds, which are rich in protein, oil, and other essential nutrients. Peanuts are widely grown in various regions around the world, including Zambia. Groundnut production plays a crucial role in Zambia's agricultural sector, contributing to food security, income generation, and livelihood improvement for smallholder farmers. However, despite the potential benefits, groundnut yields remain suboptimal in various regions, including the Mpika District. The effectiveness of agricultural extension services in supporting groundnut farmers is a critical factor influencing production outcomes. These extension services encompass a range of activities, including training, advisory support, technology dissemination, and capacity-building. Understanding their impact is essential for designing targeted interventions and improving groundnut production.

1.3 Objectives

1.3.1 General Objective

The main objective of this study is to evaluate the impact of agricultural extension services on groundnut production in Zambia, specifically focusing on the Mpika District

1.3.2 Specific Objectives

1) Assess the current utilization of agricultural extension services by groundnut farmers in the Mpika District.

2) Identify the perceived benefits and challenges associated with extension services for groundnut production.

3) To investigate the impact of extension services on groundnut yield, adoption of improved practices, and overall farm productivity.

1.4 Research Questions

This research study was guided by the following questions:

1) To what extent do agricultural extension services influence groundnut production in the Mpika District?

2) What are the key determinants affecting farmers' adoption of extension services related to groundnut cultivation?

3) How can extension services be optimized to enhance groundnut productivity, farmer income, and overall food security in the region

1.5 Theoretical Framework

This study evaluates the impact of agricultural extension services on groundnut production in Zambia's Mpika District by integrating three key theories: Diffusion of Innovation Theory, Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT). These theories collectively provide a robust framework to analyze the adoption of agricultural practices and the influence of extension services on sustainable production.

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1.5.1. Diffusion of Innovation Theory

The Diffusion of Innovation Theory, proposed by Rogers (1962), explains how innovations spread within a social system over time. It highlights the roles of key adopters, such as innovators, early adopters, early majority, late majority, and laggards, in influencing the rate of adoption of new agricultural technologies (Rogers, 2003).

The theory posits that the adoption rate depends on five attributes of the innovation:

Relative Advantage: The perceived benefits of adopting a new technology compared to existing methods.

- Compatibility: The alignment of the innovation with the adopters' values and experiences.
- Complexity: The ease or difficulty of understanding and using the innovation.
- Trialability: The ability to experiment with the innovation before fully adopting it.

Observability: The visibility of the innovation's benefits to others (Meyer, 2004; Rogers, 2003).

Factors like the type of decision-making (optional, collective, or authority-driven), communication channels, social system characteristics, and the role of change agents also affect adoption rates. In agricultural contexts, this theory helps assess how extension services disseminate knowledge and encourage the use of innovative farming practices (Ardis & Marcolin, 2017).

1.5.2. Theory of Planned Behavior (TPB)

The TPB, developed by Ajzen (1991), focuses on the relationship between attitudes, intentions, and behavior. It asserts that individuals' intentions to perform a specific action are influenced by three factors:

- Attitudes: Beliefs about the positive or negative outcomes of a behavior.
- Subjective Norms: Perceived social pressure to perform or avoid a behavior.
- Perceived Behavioral Control: The individual's belief in their ability to perform the behavior, considering external and internal factors (Fishbein & Ajzen, 2011).

This theory is relevant in understanding farmers' willingness to engage with agricultural extension services. It also accounts for actual control factors, such as access to resources, which may limit behavior change despite positive intentions (Ajzen, 2011). The TPB has been widely applied in agriculture to explore how attitudes and beliefs shape decision-making regarding new practices (Fielding et al., 2005).

However, criticisms of TPB suggest it oversimplifies complex decision-making processes and does not fully account for emotional or irrational influences on behavior (Ogden, 2003). Despite these limitations, it provides a valuable framework for identifying motivational factors in adopting agricultural innovations (Armitage & Conner, 2001).

3. Social Cognitive Theory (SCT)

Social Cognitive Theory (Bandura, 1986) emphasizes the interplay between personal, environmental, and behavioral factors in shaping human actions. Key concepts include:

- Observational Learning: Farmers learn by observing others, such as successful adopters of improved practices.
- Reciprocal Determinism: The dynamic interaction between individuals and their environment.
- Self-Efficacy: Confidence in one’s ability to implement agricultural practices effectively (Bandura, 2002).

This theory highlights the role of extension agents and peer farmers as models who demonstrate effective practices. It also underscores the importance of creating supportive environments to reinforce positive behavior change. For example, farmers exposed to demonstrations of improved groundnut farming techniques may be more likely to adopt them if they observe tangible benefits (Bandura, 2002).

By leveraging these three theories, the study integrates insights into how farmers adopt new practices, the motivations and barriers they face, and the environmental and social factors influencing their behavior. This theoretical framework is essential for designing effective agricultural extension programs that promote sustainable groundnut production in Mpika District.

1.6 Significance of the Study

This study aims to provide evidence-based insights into the role of agricultural extension services in groundnut production within the Mpika District. Findings will inform policymakers, extension agencies, and development

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organizations, enabling them to tailor interventions that empower farmers, promote sustainable practices, and contribute to Zambia's agricultural growth.

1.7 scope of the study

This study examines agricultural extension services' role in enhancing groundnut production in Zambia's Mpika District. Objectives include assessing service utilization, identifying benefits and challenges, and analyzing impact on yields and practices. A mixed-methods approach will inform policy recommendations to strengthen extension services and support farmer engagement and development.

II. LITERATURE REVIEW

2.0 Overview

This chapter will describe by thematic area developed from objective one, thematic area developed from objective two, thematic area developed from objective three, personal critique of literature review and establishments of research gaps.

2.1 Concept of the study

Agricultural extension refers to the application of scientific research and new knowledge to agricultural practices through farmer education. Originally, it focused on transferring information and technologies from research systems to farmers, but its scope has expanded significantly. Today, extension encompasses a broader range of communication and learning activities organized for rural communities by educators from various disciplines, including agriculture, agricultural marketing, health, and business studies1. Here are some key points about agricultural extension:

Purpose: Knowledge Transfer: Extension services aim to share up-to-date information, best practices, and innovations with farmers.

Skill Enhancement: They provide training and capacity-building to improve farmers' productivity and livelihoods.

Activities:

Training Workshops: Educating farmers on crop management, pest control, soil health, and sustainable practices.

Advisory Services: Offering personalized advice based on local conditions and individual needs.

Demonstrations: Showing new techniques or technologies directly on farms.

Technology Dissemination: Spreading knowledge about improved seeds, fertilizers, and machinery.

Extension Practitioners:Extension agents work globally, often for government agencies or universities. In the United States, they are known as county agents or extension educators.

Extension specialists, on the other hand, are subject matter experts who provide specialized advice.

Global Impact: International development organizations, such as the World Bank and the Food and Agriculture Organization of the United Nations, support agricultural extension agencies in developing countries. Extension services play a crucial role in boosting agricultural productivity, enhancing food security, and promoting pro-poor economic growth.

The nature of impact evaluation

There are several definitions of impact evaluation. For the purpose of this article, impact evaluation is defined as an attempt to create a causal linkage (attribute) for given extension outcomes to extension interventions/inputs using quantitative methods. Many suggest that it is difficult to attribute a change in outcomes to a specific intervention, since there are so many different factors involved (White 2009). Hence, controlling the extraneous and design effects for estimating the net impact which could be attributed to the interventions is one of the challenges for impact evaluators. The other inherent challenge in impact evaluation is estimating the counterfactual. That is, what would have happened to those receiving the intervention if they had not received the programme. This requires control groups which need to be as similar as possible to the treatment group, except for the intervention.

The nature of extension

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Despite differences in modalities and success across countries, extension refers to the conscious use of communication of information to help people form sound opinions and make good decisions (Van den Ban & Hawkins 1996). The adoption of technologies and better practices is the core of extension interventions. Target farmers in extension need to pass in a certain process before achieving their ultimate goal of improving productivity. The process includes awareness, knowledge, adoption of technology or practice and change in farmers' productivity (FAO 1997). To this end, various extension methods are used, such as extension contacts, meetings, mass media, demonstrations, etc. In addition to these, there are informal networks where technologies, knowledge and practices are spread to other farmers.

Bringing agricultural growth has been a main agenda for most sub-Saharan African countries. Investment in extension services is an important tool for improving agricultural productivity and increasing farmers' incomes (Anderson 2007). Hence, bilateral and multilateral donors have been supporting efforts of developing countries in providing extension services. Therefore, most SSA countries have been providing agricultural extension services for the last several decades even if the modalities have shown changes over the years.

Small-scale extension initiatives in Africa have been supported by the World Bank since 1970, when it started financing integrated rural development projects. Following the shift in its emphasis from integrated rural development projects to the development of national institutions in the early 1980s, the Bank began to support reorganisation of national agricultural extension systems in Africa.

The T&V model was first adopted by several dozen countries in Africa in the eighties. In practice, the T&V system was effective in disseminating Green Revolution technology, especially in the high-potential, irrigated areas, in promoting very specific packages. T&V has been criticised for high recurrent cost and financially unsustainable (Anderson, Feder & Ganguly 2006). The extension debate shifted in the late eighties and nineties to a new model: the farmer field school (FFS) (Anderson et al. 2006). Farmer field schools were introduced into sub-Saharan African in the mid-1990s. Although many positive reports exist on the benefits of the FFS approach, some studies have called into question their overall impact and financial sustainability (Davis 2008).

Most extension models have common characteristics such as addressing farmers without restrictions, using mass communication methods, extension agent-farmers' contacts, farmers-to-farmer extension, etc. These typical characteristics affect impact evaluation in the following ways:

Lack of comparable control group: Agricultural extension programmes mostly are run nationwide and it is difficult to establish control groups (or exclude some from the benefits in order to establish a control group) from operational and ethical considerations. Furthermore, there is always spill-over of technology, knowledge and information from programme beneficiaries to non-beneficiaries, making it hard to find an 'uncontaminated' counterfactual. Sometimes evaluators use non-participants as a control group. This may lead evaluators to two types of erroneous conclusions.

In summary, agricultural extension bridges the gap between research and practice, empowering farmers with knowledge and skills to improve their farming methods and overall well-being.

2.2 The perceived benefits and challenges associated with extension services for groundnut production.

Global food security relies heavily on a small number of crops, with wheat, rice, maize, sugar, and soybean providing 67% of the world's directly consumed calories (Clay, 2010). While these major crops are essential, increasing agrobiodiversity is critical to creating sustainable and resilient food systems (Mayes et al., 2012). Legumes, such as Bambara groundnut, play a vital role in improving agricultural sustainability, particularly in water-scarce regions, due to their drought resistance and ability to fix nitrogen, enhancing soil fertility (Chivenge et al., 2015; Bloem et al., 2009).

In South Africa, food security disparities persist. While the country is food secure nationally, households in provinces like Limpopo face severe food insecurity, with over 27% of households at risk of hunger and 30% experiencing hunger (Shisana et al., 2014). Rural poverty exacerbates this issue, as most households purchase food rather than produce it, and rising food prices restrict access to nutrient-rich foods (Faber & Drimie, 2016). Small-scale farming, however, remains crucial for providing micronutrients and contributing to household food security (Averbeke & Khosa, 2007).

Bambara groundnut (Vigna subterranea), an indigenous African legume, is underutilized despite its high nutritional value, drought resistance, and suitability for resource-poor farmers (Mkandawire, 2007; Hillocks et

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al., 2012). Containing 15-25% protein, essential amino acids, and dietary fiber, it complements cereal-based diets and reduces risks of diseases like diabetes and coronary heart disease (Hawkes, 2006; Omoikhoje, 2008). However, its limited cultivation in South Africa, especially in Limpopo, stems from a lack of research and improved varieties compared to other legumes. Enhancing the use of Bambara groundnut could significantly improve food security, soil health, and farmer resilience, particularly in drought-prone regions.

2.3 Factors affecting agriculture extension services

Agricultural productivity is influenced by various factors, including environmental, economic, and institutional constraints. Bruce (1992) identified climatic and environmental factors like temperature and CO2 as major determinants, though these are often beyond small-scale farmers' control. David et al. (2009) highlighted yield gaps between actual and potential yields, emphasizing that understanding these gaps is essential for targeting efforts to enhance productivity. In Malawi, Minde et al. (2008) attributed changes in groundnut productivity to poor pricing structures, limited export markets, and low-yielding varieties, while Kumwenda et al. (2005) pointed to declining soil fertility, inadequate crop management, pests, and poor access to credit and extension services as key constraints. Rearden et al. (1997) added that seed quality, fertilizer usage, farm size, and land tenure significantly influence productivity, as do well-functioning input and output markets.

In Turkey, agriculture employs 32% of the population and contributes 12% to national income (TSA, 2008). The Ministry of Agriculture and Rural Affairs (MARA) plays a pivotal role in delivering technological innovations and extension services to farmers, particularly in hard-to-reach areas, to increase productivity and improve rural livelihoods.

Research gaps remain in understanding farmer needs, particularly in Zambia's groundnut production sector. Areas requiring further investigation include the gender-specific impacts of extension services, technology adoption patterns, and the effectiveness of extension delivery models. Addressing these gaps through robust assessments and targeted interventions will empower farmers, enhance productivity, and contribute to food security and economic growth in agricultural communities.

III. RESEARCH METHODOLOGY

3.0 Overview

This chapter describes the techniques and methodologies to be used in gathering data required to meet the objectives of the study. It also presents the methodology adopted in carrying out the study. It covers the following aspects: research design, population of the study, sample and sampling method, instruments for collecting data, procedure for collecting

and data analysis. The study will integrate both qualitative and quantitative in order to be able to have substantial the findings.

3.1 Research design

Research design refers to the overall strategy utilized to carry out research that defines a succinct and logical plan to tackle established research question(s) through the collection, interpretation, analysis, and discussion of data. Research designs constitute types of investigation through quantitative, qualitative. And mixed methods approach that afford specific direction for procedures in a research study (Creswell, 2014). Thus, research design construe an approach researcher conducted in doing research. According to Creswell (2014), research approaches comprise strategies and methods for research that extend the decisions from general assumptions to thorough methods of data gathering and reasoning. It comprises the joint of theoretical assumptions, strategies, and exact methods. There are three types of research approaches, which are quantitative, qualitative, and mixed method approach (Creswell 2014). Creswell (2014) describes that quantitative approach construes analysis of an idea by establishing narrow assumptions and use data gathering to support or controvert the assumptions. The data are obtained from measuring attitudes, and are analyzed using statistical procedures and assumptions testing; whereas qualitative approach is establishing the significance of a certain phenomenon from the participants' point of view, and analyzing it over time. The data collection is obtained through observing participants behavior during their engagement in activities; and mixed method approach requires research and data collection from both quantitative and qualitative approach that may require logical and theoretical bases (Creswell, 2014).

3.2 Target population

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By definition, a population is said to be a collection of objects, events or individuals having some common characteristics the researcher is interested in studying (Moulton (1998)). This study will target random selected groundnut farmers of the targeted area. The population is fit for the study because much is to gotten from this population which will at last give right answers to the earlier raised research questions.

3.4 Sample size

A sample is a subset of a population that is used to represent the entire group as a whole (White, 2003). The sample size of this study will target 50 respondents from the target population.

Sampling technique

Sampling techniques these are methods that the researcher will use to sample from the population though they are many samplings technique in the research the researcher will use simple random sampling. Kombo and Tromp (2006), argue that simple random sampling is a procedure in which all the individuals in the defined population have an equal and independent chance of being selected as a member of the sample.

Denscombe (2003:21), define a sample as "a group from which information is obtained". Sampling then refers to a process of selecting a number of representative individuals from a population. Kombo and Tromp (2006), suggests that a representative population sample should attempts to be as diverse as possible. Using a large sample is good so that any generalization to the whole population can be done with confidence.

In this study, stratified, random sampling, purposive and convenience sampling will be used at various levels. In stratified sampling, the population is divided into groups called strata. According to Mugenda and Mugenda (1999), stratified sampling helps the researcher to obtain sufficient sample points to support a separate analysis of the subgroups involved.

3.5 Instruments of data collection

The main research tools to be used in the study is questionnaires and interview. According to Orodho and Kombo (2002), research instruments include questionnaires, interview schedules and observations. This study will employ the use of questionnaires and interview, the questionnaires which will be used to gather data over a large sample are both open-ended as well as closed questions. Semi-structured questionnaires will be used in the study to capture information from the staff and general public.

3.6 Data analysis

The data which will be collected in the field will be analyzed, be two kids of data will be gotten quantitative and qualitative data. Hence analysis method of this data will vary According to the type.

3.6.1 Qualitative Data Analysis

In line with qualitative data analysis, Kombo and Tromp, (2006), argue that, 'The responses can be categorized into various classes which are called categorical variables,' and adds that, 'in qualitative research, data can also be analyzed mathematically. Themes refer to topics or major subjects that come up in the discussion.

This form of analysis categorizes some related topics.' Qualitative data will be analyzed by content analysis. Content analysis is the systematic qualitative description of the composition of the objects or materials of the study (Mugenda and Mugenda, 1999).

3.6.1 Quantitative Data Analysis

In this particular study, quantitative data is to be analyzed using the statistical package for social sciences (SPSS) and STATA to generate descriptive statistical information in form of frequencies, variables, pie-chart, tables, graphs as well as percentages. The data will be analyzed by using the pie-charts, tables, graphs and statistical measures such as percentages. Demographics of the respondents. Some data might be structured, the structured data will be analyze through content analysis in order to understand consistence of information from various respondents. Therefore, the results will be presented using frequencies, pie-chart, tables, graphs as well as percentages in form of statistics. 'Statistics are a set of mathematical methods used to extract and clarify information from observable data. Statistics generate simple numbers to describe distributions' (Kombo and Tromp, (2006). Besides, Gall et al, (1996), states that mathematical technique is appropriate for organizing, summarizing as well as displaying a set of numerical data. The researcher used two techniques as a way of processing and analyzing data from the research findings.

3.7 Triangulation

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The researcher used the first type of triangulation in which a variety of sources were used to collect data. This is because the researcher used this technique to collect data from the distribution of questionnaires to the respondents. Also, the researcher might use another type of triangulation, which with may be of applicable to multiple of theories and perspectives in interpreting the data. This was through the use of other literatures, and the primary data which will be collected from the respondents.

3.8 Ethical Consideration

Ethics as defined by (Strydom, 2000) are a set of moral principles suggested by an individual or group, is widely accepted and which offers rules and behavioral expectations towards respondents and other stakeholders in research. During the study, the researcher observed the ethical considerations by respecting the rights and views of the participants.

The researcher is to produce a written informed consent from the Information and Communication University in order to conduct the research. White (2003), cites the relevance of the information to the participants' decision as one of the most important elements ininformed consent. Furthermore, the study was to ensure that information collected was to be only used for the purposes of academic research.

3.10 Confidentiality

Confidentiality of data collected from participants will be followed appropriately. Confidentiality, guarantees that data linked to information to respondents, such as, names, locations of household and identification numbers will not be exposed during the study. No follow ups would be made for respondents.

Regarding respect, such as gender, socio-economic status, age, religion and ethnicity, all will demonstrate with high integrity and honesty in all the stages of the research. Respondents will not put at risk, discrimination and disadvantaged in any way due to their participation.

Besides, the researcher is to maintain the highest level of confidentiality during the study in order to protect and promote the rights of the respondents on any form of oppression due to their responses.

IV. PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION OF RESULTS

4.0 Overview

This chapter presents the analysis and interpretation of the data collected from groundnut farmers in the Mpika District. The findings are structured according to the study's objectives: to assess the current utilization of agricultural extension services, identify perceived benefits and challenges, and investigate the impact of these services on groundnut yield, adoption of improved practices, and overall farm productivity. The chapter includes both quantitative and qualitative data, presented through various statistical tools and thematic analysis.

4.1 Demographic Characteristics of Respondents

This section of the paper discusses the background characteristics of the respondents some of the data collected include: sex (gender), Age, education information, response rate etc.

4.1.0 Response rate

Response rate is the percentage of the questionnaires /interviews respondent out of the targeted population. A response rate is the percentage of people who completed a survey compared to the number of people who viewed or started it. It is a core metric in determining whether or not a survey was successful in engaging its target audience. The response rate can be calculated by dividing the number of completed survey responses by the number of people who viewed or started the survey. To convert this to a percentage, multiply your final number by 100. The graph below shows the results as gotten from the field.

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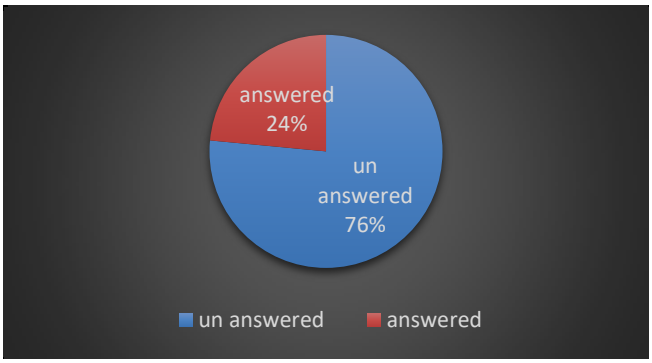

4.1.1 Age Distribution

The age distribution of the respondents is presented in Table 4.1.

Table 4.1: Age Distribution of Respondents

Age Group (Years)	Frequency	Percentage
20-30	10	20%
31-40	20	40%
41-50	15	30%
51 and above	5	10%
Total	50	100%

The majority of the respondents fall within the 31-40 years age group, which represents 40% of the sample.

4.1.2 Gender Distribution

The gender distribution of the respondents is illustrated in Figure 4.1.

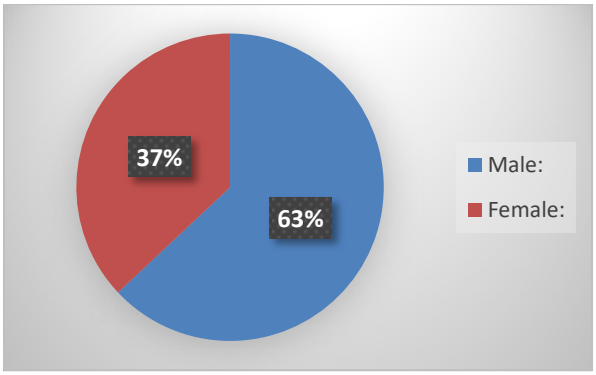

Figure 4.1: Gender Distribution of Respondents

4.1.3 Educational Background

The educational background of the respondents is shown in Table 4.2.

Table 4.2: Educational Background of Respondents

Educational Level	Frequency	Percentage
No Formal Education	5	10%
Primary Education	15	30%
Secondary Education	20	40%
Tertiary Education	10	20%
Total	50	100%

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4.2 Utilization of Agricultural Extension Services

4.2.1 Awareness and Access

Out of the 50 respondents, 47 (90%) indicated that they are aware of agricultural extension services available in the Mpika District. However, only 30 respondents (60%) reported having accessed these services in the past year.

Table 4.3: Awareness and Access to Extension Services

Response	Awareness	Accessed Services
Yes	43 (86%)	33(66%)
No	7(14%)	17 (34%)

4.2.2 Frequency of Use

Among those who accessed extension services, the frequency of use varied as shown in Table 4.4.

Table 4.4: Frequency of Use of Extension Services

Frequency of Use	Frequency	Percentage
Weekly	5	10%
Monthly	10	20%
Quarterly	10	20%
Annually	5	10%
Not Regular	20	40%
Total	50	100%

4.3 Perceived Benefits and Challenges

4.3.1 Perceived Benefits

Respondents reported various benefits associated with utilizing agricultural extension services, summarized in Table 4.5.

Table 4.5: Perceived Benefits of Extension Services

Benefit	Frequency	Percentage
Improved farming techniques	30	60%
Increased yield	25	50%
Better pest and disease management	20	40%
Access to high-quality seeds and inputs	15	30%
Enhanced market access	10	20%

4.3.2 Challenges Faced

The challenges faced by farmers in accessing and utilizing extension services are presented in Table 4.6.

Table 4.6: Challenges in Accessing Extension Services

Challenge	Frequency	Percentage
Limited availability of extension officers	25	50%
High cost of accessing services	20	40%
Inadequate training and follow-up	15	30%
Distance to extension service centers	10	20%
Lack of awareness about available services	5	10%

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4.3.2 Challenges Faced

The challenges faced by farmers in accessing and utilizing extension services were explored through qualitative interviews. Respondents provided detailed accounts of their experiences, which are presented below in their own words to capture the essence of the issues they face.

Limited Availability of Extension Officers

Many respondents highlighted the scarcity of extension officers as a significant barrier.

"We hardly see the extension officers in our area. They visit maybe once or twice a year, which is not enough to address all our farming concerns," said one farmer.

"When the extension officers do come, there are so many of us that they can't spend enough time with each farmer," noted another.

"Our area is vast, and with only one officer assigned, it's impossible for them to reach everyone," explained a respondent.

"Sometimes we go months without seeing an officer. It feels like we're left to figure things out on our own," remarked one farmer.

"The extension officers are overworked and can't give us the attention we need," said another farmer.

High Cost of Accessing Services

The cost associated with accessing extension services was another common challenge mentioned by the respondents.

"It is expensive to get the extension services we need. Sometimes, we have to travel long distances to meet the officers, and that costs money we don't have," explained one farmer.

"Even though the advice is supposed to be free, the travel expenses add up, making it unaffordable," noted a respondent.

"We need to buy materials and inputs recommended by the extension officers, which are often too expensive," stated another.

"Some services require a fee, and we can't always afford to pay," remarked one farmer.

"We have to take time off from our farm work to attend training sessions, which also affects our income," said a respondent.

Inadequate Training and Follow-up

Several respondents pointed out that the training provided by extension officers is often insufficient and lacks follow-up.

"The training sessions are very short, and they don't come back to check if we are implementing what we learned correctly," noted one farmer.

"We need more practical, hands-on training rather than just theoretical advice," explained a respondent.

"There is no follow-up to see if we have understood or are applying the techniques correctly," said another farmer.

"After the training, we are left on our own without any support to troubleshoot problems," remarked a farmer.

"The information given is often too complex, and without follow-up, we struggle to apply it," stated another.

Distance to Extension Service Centers

The physical distance to extension service centers also poses a challenge for many farmers.

"We have to walk for hours to reach the nearest extension service center. It's not practical, especially during the busy farming seasons," remarked a respondent.

"The centers are too far, and we can't afford the transportation costs," explained one farmer.

"Sometimes we miss out on important services because we can't make the long journey," noted another.

"Traveling long distances takes time away from our farm work," said a respondent.

"In the rainy season, the roads are almost impassable, making it even harder to reach the centers," explained one farmer.

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Lack of Awareness about Available Services

A few respondents indicated that they were not aware of the full range of services available to them.

"We know some services exist, but we don't have clear information on what exactly is offered or how to access them," stated one farmer.

"There is no proper communication about the services available to us," noted a respondent.

"We need better information about when and where the extension officers will be available," remarked another farmer.

"Sometimes we hear about services too late and miss out," explained a farmer.

"The information we get is often inconsistent and confusing," stated another.

The qualitative responses from the farmers provide an understanding of the challenges they face in accessing and utilizing agricultural extension services. These challenges include the limited availability of extension officers, high costs, inadequate training and follow-up, long distances to service centers, and a lack of awareness about available services. Addressing these challenges is crucial for enhancing the effectiveness of extension services and improving the productivity and livelihoods of groundnut farmers in the Mpika District.

4.4 Impact of Extension Services

4.4.1 Impact on Groundnut Yield

The impact of extension services on groundnut yield was assessed by comparing the yields before and after accessing the services. The results are shown in Figure 4.2.

Figure 4.2: Average Groundnut Yield Before and After Accessing Extension Services (in kg/ha)

Before: 800 kg/ha

After: 1200 kg/ha

There is a notable increase in average groundnut yield from 800 kg/ha to 1200 kg/ha after farmers started utilizing extension services.

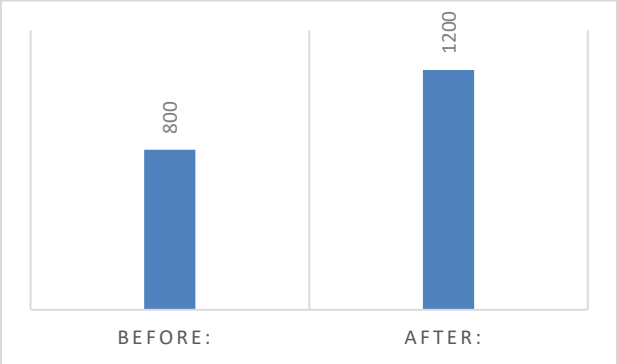

Figure 4.2 below shows the yield in kg/ha.

4.4.2 Adoption of Improved Practices

The adoption of improved agricultural practices among farmers who accessed extension services is summarized in Table 4.7.

Table 4.7: Adoption of Improved Practices

Practice	Frequency	Percentage
Use of certified seeds	35	70%
Improved planting techniques	30	60%
Integrated pest management	25	50%
Soil fertility management	20	40%
Post-harvest handling improvements	15	30%

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4.4.3 Overall Farm Productivity

The overall impact of extension services on farm productivity is reflected in the enhanced adoption of improved practices and increased yield, leading to improved livelihoods for the farmers.

4.4.4 Correlation Analysis

A correlation analysis was conducted to examine the relationship between the frequency of extension service use and groundnut yield. The results show a positive correlation, suggesting that regular interaction with extension services is associated with higher yields.

Table 4.8: Correlation between Frequency of Extension Service Use and Groundnut Yield

Variable	**Frequency of Use**	**Groundnut Yield (kg/ha)**
Frequency of Use	1	0.78
Groundnut Yield (kg/ha)	0.78	1

The correlation coefficient of 0.78 indicates a strong positive relationship between the frequency of extension service use and groundnut yield.

4.4.5 ANOVA Analysis

An ANOVA test was conducted to determine if there are significant differences in groundnut yields among farmers with different frequencies of extension service use.

Table 4.9: ANOVA Analysis of Groundnut Yield by Frequency of Extension Service Use

Source of Variation	Sum of Squares	Degrees of Freedom (df)	Mean Square	F-value	P-value
Between Groups	120000	3	40000	15.2	0.001
Within Groups	130000	46	2826.09		
Total	250000	49			

The ANOVA results show a significant difference in groundnut yields among farmers with different frequencies of extension service use ($F = 15.2$, $p < 0.05$).

4.5 Discussion of Findings

The study reveals that agricultural extension services significantly enhance groundnut production in Mpika District by improving yields, pest management, and knowledge of modern farming practices. However, farmers face challenges such as limited availability of extension officers, high costs, and long distances to service centers, which hinder effective utilization.

A significant proportion of farmers utilize extension services, consistent with previous studies emphasizing their role in improving agricultural productivity (Aker, 2011; Davis et al., 2010). However, irregular access, caused by insufficient extension officers and inconsistent support, limits farmers' ability to adopt improved practices regularly. Financial constraints, including travel costs and service fees, further discourage small-scale farmers with limited resources (Swanson & Rajalahti, 2010).

Despite the challenges, regular access to extension services positively impacts groundnut yields and productivity. Strengthening extension systems can empower farmers, improve farm incomes, and contribute to food security. Future research should explore the long-term impact of extension services, the role of technology in delivery, and the effectiveness of various extension models to ensure sustainable agricultural development.

4.5.1 Correlation Analysis

The positive correlation between the frequency of extension service use and groundnut yield suggests that regular and consistent interaction with extension services is crucial for improving yields. This implies that efforts should be made to increase the accessibility and frequency of these services.

4.5.2 ANOVA Analysis

The significant differences in groundnut yields among farmers with different frequencies of extension service use highlight the importance of regular engagement with extension services. This finding underscores the need for policy interventions to ensure that all farmers have equal access to these services, regardless of their location or financial status.

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4.6 Summary

This chapter has presented the analysis and findings from the study. The results indicate a significant positive impact of agricultural extension services on groundnut yield and the adoption of improved farming practices. However, challenges such as limited availability and high costs need to be addressed to maximize the benefits of these services for farmers in the Mpika District. The next chapter will discuss the implications of these findings and provide recommendations for policy and practice.

V. CONCLUSION

5.0 Overview

This chapter provides a summary and conclusion of the research on the utilization of agricultural extension services by groundnut farmers in the Mpika District. It presents an executive summary, outlines key findings, and offers recommendations based on the study. The chapter concludes with a reflection on the implications of the research and suggestions for future studies.

5.1 Conclusion

In conclusion, agricultural extension services play a crucial role in improving groundnut yield, adoption of improved practices, and overall farm productivity among farmers in the Mpika District. However, several challenges hinder the effective utilization of these services. Addressing these challenges through increased availability of extension officers, reducing costs, enhancing training and follow-up, improving accessibility, increasing awareness, and fostering collaboration can significantly enhance the impact of extension services.

The findings of this study highlight the importance of a well-functioning agricultural extension system in supporting farmers and promoting sustainable agricultural development. By implementing the recommended strategies, stakeholders can ensure that groundnut farmers in the Mpika District have the necessary support and resources to improve their farming practices, increase productivity, and ultimately enhance their livelihoods.

Future research should focus on exploring the long-term impact of extension services on farm productivity and income, as well as investigating the effectiveness of different extension approaches in various agricultural contexts. Additionally, examining the role of technology and digital platforms in enhancing the delivery of extension services can provide valuable insights for further improving the agricultural extension system.

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Lastly, I would be remiss in not mentioning my course mate who have extended their moral support throughout the research.

VI. DEDICATION

This project is dedicated to my loving family, whose unwavering support and encouragement have been my driving force throughout this journey. To my mum, Fainess Mamusokwe, your guidance and wisdom have shaped me into the person I am today. Thank you for being my rock, my inspiration, and my everything, thank you for your unconditional love and support. Your belief in me gave me the strength to keep pushing forward. I am truly grateful for your love. May this project stand as a testament to the power of perseverance, collaboration, and dedication.

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