FACTORS AFFECTING ADOPTION OF AGRICULTURAL TECHNOLOGIES BY NAADS FARMERS IN KUMI DISTRICT: THE CASE OF FERTILIZER APPLICATION IN CITRUS.

BY

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REG NO: 11/MMSPPM/26/053

A DISSERTATION SUBMITTED TO THE HIGHER DEGREES DEPARTMENT IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE IN MANAGEMENT STUDIES (PROJECT PLANNING AND MANAGEMENT) OF UGANDA MANAGEMENT INSTITUTE

SEPT 2015

DECLARATION

I **Emurwon Joseph** hereby declare that this work is my original and it has not been submitted either partially or wholly for any academic award or publication in any institution. I have dully acknowledged all the sources consulted for the development of this dissertation.

Sign:……..

Date:……..

APPROVAL

This is to certify that this dissertation entitled ‘’Factors affecting adoption of Agricultural Technologies By NAADS farmers in Kumi district: the case of fertilizer application in citrus’’ was done under our supervision and is now ready for submission for the award of the Masters Degree in Management Studies (Project Planning and Management) of Uganda Management Institute.

SIGN:…….DATE…….

DR. MARIA K. BARIFAIJO

SIGN:…….DATE……..

MR. LUGEMOI WILFRED BONGOMIN

DEDICATION

Dedication of this piece of work goes to my late biological father **Opolot Lawrence Andrew**. You will always be remembered by the recipients of your genes. May you rest in peace.

ACKNOWLEDGEMENT

The researcher seeks to acknowledge the following persona for their contribution in material support, knowledge and emotion.

Uncle Joseph Olebo has been a good mentor. As a guardian, he has done a lot beyond imagining.

My wife Prisca makes the land of the living a fair place.

Finally the efforts my supervisors Dr. Maria K. Barifaijo and Mr. Lugemoi Wilfred Bongomin can't go unnoticed. They did a great job as regards knowledge transfer for this particular piece of work. May the Almighty God always bless the works of their hands.

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LIST OF ABBREVIATIONS AND ACRONYMS

NAADS - National Agricultural Advisory Services

PEAP – Poverty Eradication Action Plan

PMA – Plan for Modernization of Agriculture

UBOS - Uganda Bureau of Statistics

UGSHS – Uganda Shillings

IPM – Integrated Pest Management

NRM – National Resistance Movement

CRIN – Cocoa Research Institute of Nigeria

UMI – Uganda Management Institute

FIEFOC – Farm Income Enhancement and Forest Conservation

DLG – District Local Government

SPSS – Special Package for Social Scientists

FAL – Functional Adult Literacy

ABSTRACT

This study examined the factors affecting adoption of agricultural technologies by NAADS farmers in Kumi district considering fertilizer use in citrus as a case for this research. The objectives of this study were; to assess the effect of education level of farmers on agricultural technology adoption; to explain the effect of political environment on agricultural technology adoption and finally to examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district. The theories which guided this research were diffusion of innovation theory and concerns based adoption model. The researcher was motivated to this study because of low levels of agricultural technology adoption observed under the NAADS program despite funds flowing from the central government to districts. The literature reviewed revealed that indeed education level of the farmers, political environment and extension services affected agricultural technology adoption. A case study cross sectional survey research design was applied in which case both qualitative and quantitative approaches of data analysis were employed. A total of 162 respondents were sampled from 280 farmers from Nyero and Ongino Sub Counties and the response was 135 from 162 respondents sampled. The methods used to collect data were; questionnaire survey, interviewing, observation and documentary review. Data was analyzed and interpreted and the researcher concluded that; education level of farmers, political environment and extension services positively affected agricultural technology adoption under the NAADS program in Kumi district; political environment being the biggest contributor to low agricultural technology adoption levels. The study recommends for strengthening of FAL classes to enable farmers to learn how to read and write, Capacity building of leaders to enhance their leadership skills, and adequate facilitation of the extension staff. The study was limited by time, content and geographical scope and also the research methodology used. The study contributes to the body of knowledge of technology adoption studies.

APPENDICES:

Appendix 1: Krejcie and Morgan's table (1970) for determining sample size for finite population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2,800	338
15	14	110	86	290	165	850	265	3,000	341
20	19	120	92	300	169	900	269	3,500	346
25	24	130	97	320	175	950	274	4,000	351
30	28	140	103	340	181	1,000	278	4,500	354
35	32	150	108	360	186	1,100	285	5,000	357
40	36	160	113	380	191	1,200	291	6,000	361
45	40	170	118	400	196	1,300	297	7,000	364
50	44	180	123	420	201	1,400	302	8,000	367
55	48	190	127	440	205	1,500	306	9,000	368
60	52	200	132	460	210	1,600	310	10,000	370
65	56	210	136	480	214	1,700	313	15,000	375
70	59	220	140	500	217	1,800	317	20,000	377
75	63	230	144	550	226	1,900	320	30,000	379
80	66	240	148	600	234	2,000	322	40,000	380
85	70	250	152	650	242	2,200	327	50,000	381
90	73	260	155	700	248	2,400	331	75,000	382
95	76	270	159	750	254	2,600	335	100,000	384

Appendix 2: Field Research Letter

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Our Ref: G/35

06 September 2013

Mr. Joseph Emurwon
11/MMSPPM/26/053

Dear Mr. Emurwon,

FIELD RESEARCH

Following a successful defense of your proposal before a panel of Masters Defense Committee and the inclusion of suggested comments, I wish to recommend you to proceed for fieldwork.

Please note that the previous chapters 1, 2 and 3 will need to be continuously improved and updated as you progress in your research work.

Wishing you the best in the field.

Yours sincerely,

Gerald Karyeija (PhD)
AG. DEAN, SCHOOL OF MANAGEMENT SCIENCES

Appendix 3: The Questionnaire

My name is EMURWON JOSEPH, a student at Uganda Management Institute. I am carrying out research on the factors affecting the adoption of agricultural technologies in Kumi district where I have considered the NAADS program to carry out the study. This questionnaire is intended for farmers and I have selected you as one of the respondents. Please help and give your objective responses. This questionnaire is strictly for academic purposes and any information you will avail will be treated with the highest degree of confidentiality. Thank you for accepting.

Section A: Bio Data

Please tick the appropriate

Age in years: A) 18 - 30 B) 31- 40 C) 41 – 50 D) 51 and above

Gender: A) Male B) Female

Physical Ability Status: A) Disabled B) Not disabled

Health status: A) Has a chronic illness B) Has no chronic illness

Family size: A) 0 – 5 members B) 6 members & above

Experience in Citrus farming in years: A) 0 - 3 B) 4 – 6 C) 7- 9 D) 10 and above

Under the following sections, you will tick the appropriate box in the order of 1 – Strongly Agree, 2 – Agree, 3 – No Comment, 4 – Disagree and 5 – Strongly disagree.

Section B: Technology Adoption

		1	2	3	4	5
1	You know the intension of NAADS					
2	You get to know the NAADS budget					
3	You know what you are entitled to in terms of inputs in NAADS					
4	You know the specifications of the inputs you received					
5	The technologies you receive are in good condition					
6	You receive Agricultural inputs in time					
7	The weather is conducive for agricultural production					

8	You know the general management of a citrus field					
9	All the seedlings you received are in the field					
10	All the seedlings you received are healthy					
11	You use fertilizers in your citrus field					
12	You actually attend agricultural trainings					
13	You understand what extension workers train you					
14	You apply what you learn					
15	You train other farmers in your citrus field					
16	You get other additional trainings like agribusiness trainings.					
17	You get additional knowledge by listening to radio					
18	You get additional information by reading the news papers					

Section C: Education level of farmers

		1	2	3	4	5
1	You can read and write					
2	You have attended formal education up to P7					
3	You have attended formal education up to S4					
4	You have attended formal education up to S6					
5	You have a diploma					
6	You have a degree					
7	You have a Masters					
8	You have a PhD					
9	There are functional adult literacy classes in your sub county					
10	You attend functional adult literacy classes					

Section D: Political Environment

		1	2	3	4	5
1	You understand the NAADS guidelines					
2	You know that NAADS guidelines have kept changing					
3	You are comfortable with ever changing NAADS guidelines					
4	You like the current NAADS guidelines					
5	You think the idea of giving startup inputs to a farmer is improving adoption of modern farming practices					
6	Your political leaders are supportive of the NAADS program					
7	Your political leaders consult with you on NAADS issues					
8	You like the decisions leaders make as regards NAADS					
9	The relationship between your political leaders and technical staff is good					
10	Your political leaders provide you with NAADS information					
11	The information political leaders give you rimes with that from the technical people					
12	Your political leaders monitor the NAADS activities					
13	They communicate the findings of their monitoring to farmers					
14	They implement corrective measures					
15	There is theft of agricultural products like citrus fruits in your village					
16	You report these complaints to your leaders					
17	The leaders ensure there is fair hearing in case of theft/damage to your citrus trees by a neighbor.					

Section E: Extension Services

		1	2	3	4	5
1	The extension workers are in contact with you					
2	The NAADS coordinator is in contact with you					
3	The number of extension staff is enough					
4	The extension workers come to train farmers					
5	The extension workers follow their training programs					
6	The training programs cover your farming needs					
7	Other than government Extension workers, you receive extension workers from other organizations					
8	You receive trainings from your community based facilitator					
9	You think that extension workers are well facilitated					
10	They were given government motorcycles					
11	The extension workers are well supervised					

Appendix 4: The Interview Guide

My name is EMURWON JOSEPH, a student at Uganda Management Institute. I am carrying out research on the factors affecting the adoption of agricultural technologies in Kumi district where I have considered the NAADS program to carry out the study. I have selected you as one of the respondents. Please help and give your objective responses. This interview is strictly for academic purposes and any information you will avail will be treated with the highest degree confidentiality. Thank you for accepting.

Section A: Bio data

Age in years: A) Below 35 B) 35 – 50 C) 50 and above

Education level: A) Certificate B) Diploma C) Degree D) Masters

Section B: Technology Adoption

1. Any knowledge of the NAADS budget?
2. Do you think that farmers know what are entitled to in terms of inputs
3. Do farmers really receive their technologies in good condition?
4. Are farmers given the specifications of the inputs they receive?
5. Do farmers receive Agricultural inputs in time?
6. What is your opinion about the current weather conditions as regards agricultural production?
7. Are farmers well versed with general citrus management?
8. Do you think that farmers still have the seedlings they received in the fields?
9. On average do you see these trees doing well?
10. Do they use fertilizers in their citrus fields?
11. Is the farmers' attendance to trainings is very good?
12. Do you see farmers practice whatever they learn from trainings?
13. Do you see farmers sharing information either at group or individual levels?
14. Do farmers get additional trainings like agribusiness trainings?

15. Do you think that farmers follow agricultural information from the media like radio and new papers?

Section C: Education Level of Farmers

Using 10 farmers, suggest how many farmers;

1. Can read and write
2. Have attended formal education up to P7
3. Have attended formal education up to S4
4. Have attended formal education up to S6
5. Have a diploma
6. Have a bachelor's degree
7. Have a Masters degree
8. Have a PhD
9. Are there functional adult literacy classes in your sub county?
10. Do farmers attend functional adult literacy classes?

Section D: Political Environment

1. Do you think farmers understand NAADS guidelines?
2. Are farmers aware that NAADS guidelines keep changing?
3. Do you think that the farmers are comfortable with the current guidelines?
4. What is your opinion about the existing guidelines?
5. What do you think of the idea of giving the startup inputs to farmers; good or bad? Why?

6. The political leaders are supportive of the NAADS program, right?
7. Do see leaders always consulting the farmers on NAADS issues?
8. Do you think the policies and the decisions made as regards NAADS are good? What do you think?
9. Do you think that the relationship between political leaders and technical staff is good?
10. Do leaders provide farmers with NAADS information
11. Do you think the information political leaders give farmers as regards to NAADS rimes with that from technical people?
12. Do politicians monitor the NAADS activities?
13. Do politicians communicate the findings of their monitoring?
14. Do these leaders implement corrective measures?
15. Is there theft of Agricultural products?
16. Do farmers report these cases to authorities?
17. Do leaders ensure there is fair hearing in case of theft/damage of a farmers' technology by a neighbor.

Section E: Extension Services

1. Are extension workers always in touch with farmers?
2. Is the NAADS coordinator in touch with farmers?
3. Do you think the current number of extension staff is enough?
4. Do you think extension workers are actually training farmers?
5. Are extension workers following their training programs

6. Do you think these trainings cover farmers' farming needs?
7. Apart from government staff, are their other extension workers from other organizations offering extension services?
8. Do you think extension workers are over worked?
9. What is your opinion about NAADS extension system?
10. Do farmers receive trainings from community based facilitators?
11. Do you think the extension workers are well facilitated?
12. Do they have motorcycles?
13. Are extension workers are well supervised by both the technical and political supervisors?

Appendix 5: Observation Checklist

1. Colour of citrus leaves
2. Knapsack sprayers
3. Measuring cylinders
4. Evidence of communication between sub counties and farmers eg visitors' book

Appendix 6: Document Review Checklist

1. The employee files
2. The work plans and budgets
3. Reports (M & E, Physical Progress and Financial)
4. Minutes of meetings
5. Farmer register
6. Farmer training programs
7. Political communications (letters)

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter presents the background to the study, problem statement, purpose/ overall objective, specific objectives, research questions, research hypotheses, the conceptual framework, significance of the study, justification of the study, scope of the study and operational definitions. The study examined the factors that affected the adoption of agricultural technologies by the National Agricultural Advisory Services (NAADS) farmers in Kumi district. The independent variable was the factors (farmers' education level, political environment and extension service delivery) whereas the dependent variable was the adoption of agricultural technologies by farmers. Adoption of agricultural technologies was measured using the number of farmers practicing fertilizer application on their citrus orchards and also ensuring that their fields are pest and disease free. The purpose of this research therefore was to find out why the adoption still remained low despite funds being sent for farmer support through local governments.

1.2 Background

1.2.1 Historical Background

The terms *agricultural education, agricultural extension* and *agricultural technology adoption* have evolved together over time and usually one can't be used without the other because all of them are aimed at improving agricultural production. The first two are aimed at knowledge transfer and the latter is aimed at knowledge implementation. Salawu (2008) traces the precursors of agricultural extension back to the 1800s when European powers produced agricultural products for export from their tropical colonies. Botanical gardens were started for purposes of demonstration and

experimentation, first in SriLanka (Ceylon) in 1821 followed by gardens in the Caribbean Islands and in West Africa.

The dissemination and use of improved agricultural technologies and management practices can be traced back thousands of years in different parts of the world, including China, Mesopotamia, Egypt and America. The origins of public or government-funded extension and advisory systems can be traced back to Ireland and the United Kingdom during the middle of the nineteenth century. During the potato famine in Ireland (1845–1851), agricultural advisors helped Irish potato farmers diversify into different food crops. Various European and North American governments observed this development, and the use of traveling instructors began in the second half of the nineteenth century by many countries (Salawu, 2008).

The term extension itself was first used to describe adult education programs organized by Oxford and Cambridge universities in England in 1867; these educational programs helped extend the work of universities beyond the campus and into the neighboring communities. This term was later formally adopted in the United States in conjunction with the universities that were originally established as teaching institutions during the 1860s (Swanson,2010; Birmingham,1999). Research activities were added in 1887, and extension activities were started in the 1890s and then formally added in 1914 as part of each university's official mandate. During the early twentieth century, the United Kingdom transferred responsibility for agricultural extension activities to the Ministry of Agriculture; these activities were then officially called *advisory services.* This same term was used by most European countries as they developed and expanded similar advisory services within their respective ministries of Agriculture (Swanson, 2010; Birmingham, 1999).

At the time of colonization of Africa, agricultural technology and knowledge transfer had already taken its toll. From 1900s throughout to the 1950s, the British colonized Africa including Uganda. Their extension approach was by decree and until independence in 1962, the British Colonial Office policy encouraged the development of co-operatives for subsistence farmers to partially convert to selling their crops: principally coffee, cotton, tobacco, and maize. The number of farmers involved rose exponentially as the co-operatives made the profits that the Asian traders had previously made. The roads, other infrastructure and security were better in this colonial period than in the late 1900s, so allowing relatively efficient transport and marketing of agricultural products (Swanson, 2010; Birmingham, 1999). Technology adoption at that time was by force; for example the chiefs would punish a farmer who did not plant his cotton in lines hence setting an example to the whole village.

There have been changes regarding agricultural technology adoption from independence to date with development of key guiding policies like the PEAP, PMA and NAADS guidelines to try to guide on how farming can be modernised; the latest being NAADS which was started in 2001 with an act of parliament, (NAADS act, 2001). The overall objective was to promote food security, nutrition and household incomes through increased productivity and market oriented farming. NAADS guidelines kept changing since its inception in 2001. The idea was to keep on track so that the farmers benefit as much as possible. This was in line with the President's vision of prosperity for all(Government of Uganda, 2005).

Despite all that was being done, there were still few successful farmers who entirely associated there agribusiness success to NAADS. This caused the implementers to be liars as they would take the visitors to the most successful farmers who had not even benefited from NAADS and therefore questioning the integrity of the program and hence the motivation to this study

1.2.2 Theoretical Background

This study was guided by the following theories; Diffusion of Innovation theory (DOI), Concerns-Based Adoption Model (CBAM) and The Technology Acceptance Model (TAM).

Diffusion of Innovations Theory suggests that for a new idea to reach the beneficiaries, the following need to be in place; Innovation, Communication channels, Time and The Social System. The theory is concerned with the manner in which a new technological idea or a new use of an old one migrates from creation to use (Everret Rogers as cited in Orr, 2003). Since this is an agricultural technology adoption study, this theory is relevant as it explains how new ideas are supposed to be put to use/implemented for the benefit of society hence the farmers.

The Concerns-Based Adoption Model (CBAM), applies to anyone experiencing change. The model holds that people considering and experiencing change evolve in the kinds of questions they ask and in their use of whatever the change is. Hord et al (2006) observed that, early questions are more self-oriented: What is it? and how will it affect me? When these questions are resolved, more questions emerge that are more task-oriented: How do I do it? How can I use these materials efficiently? How can I organize myself? and Why is it taking so much time? This model suggests that adoption can't be forced; it grows through individual effort. The job of an extension officer in agricultural technology adoption is to ensure that an individual starts from where he or she to where he/she wants to be.

The technology acceptance model (TAM) proposes that perceived ease of use and perceived usefulness predict applications usage (Venkatesh and Davis, 2000). The model suggests that when the target population thinks that the new technology is easy to use and they also find it useful, then the adoption process becomes very easy. TAM model is submerged in the CBA model as perceived ease of use and usefulness of a technology fall in all the 5 questions of the latter.

This is why this study was guided by the Diffusion of Innovation theory (DOI) and Concerns-Based adoption model (CBAM). In NAADS, the farmers' involvement in policy formulation was lacking. Famers were not given chance to internalize the new ideas because new concepts are designed every now and then. For example, once the guidelines had been formulated, the farmers tried to adjust but within the next six months, the guidelines are already changing. So this study fitted in these theories as the theories talk about change processes. Also inputs would be supplied at the wrong time and farmers struggle with them and in some instances farmers rejected these inputs. For example cassava cutting were supplied to Kumi in December 2012 when there was drought; the variety was good but farmers rejected it (Kumi DLG, 2012). The aspect of information to the lower grass root implementers sometimes can be a problem. The farmers would not have the right information as regards the NAADS program to move into right direction. Generally speaking the social system must be considered in the first place before any technology is passed to farmers. All these ideas are embedded in the DOI theory and CBA model.

1.2.3 Conceptual Background

This study was conceptualized that agricultural technology adoption was affected by; Farmers' education levels, Political environment and extension services. However other factors like poor procurement processes, delayed funds, poor technologies, and poor farmers' attendance still affected the adoption rates by the famers. This may give room for further research as this study alone could not exhaust all the possible factors affecting adoption of agricultural technologies. Formal education level of farmers as cited in the works of (Krishna, 2011), (Uematsu and Mishra, 2010) has a significant positive effect on adoption of agricultural technologies. However, the studies conducted by (Samlowski, 2011) tend to associate technology adoption to adult trainings and not necessarily formal education. The arguments advanced by Krishna, Uematsu and Mishra are contradicting; the

former insists that formal education affects adoption and later argues that formal education has no effect on adoption. For this study, formal education had an effect on adoption of agricultural technologies to a great extent.

On the other hand, political environment which is favorable is ideal for technology adoption. Mwesigwa (2009) found out that clear policies are necessary for technologies to be adopted. Clear policies coupled with good leadership styles would greatly affect any program positively. Nonetheless every program's success can't be measured without monitoring and evaluation aspect as put by (Holland & Ruedin, 2012). The later studied monitoring and evaluation and noted various advantages and among them was achieving of the program's objectives.

Extension service delivery directly affects the adoption of agricultural technologies. If the remuneration is not adequate for extension staff, then you expect their performance to drop (Fercel et al, 2008). Remuneration was seen to affect performance as the employee either fulfilled his/her needs or not. It was observed that if the employee had the pay that satisfied all his/her needs, then such an employee worked harder. This doesn't mean that only pay can motivate an employee to work hard but proper supervision as stated by (Certo, 2006) must be done for the achievement of the program's objectives. However, even if supervision and remuneration are in place, the workload may still affect performance (Fercel et al, 2008).

From the above arguments it can noted that a good education level, a comfortable political environment and extension service delivery had a positive effect on the agricultural technology adoption. Adoption is expected of farmers so that poverty can be fought. Now once adoption is ignored, the outcomes are usually painful to any society and include among others; malnutrition, food insecurity, low incomes, low levels of education, high crime rates, drunkenness, poor housing, and poor health which we can summarily call Poverty.

1.2.4 Contextual Background

The government of Uganda embraces agricultural technology adoption as one of the key ways to fighting poverty. Nevertheless, many a farmer were not taking adoption of agricultural technologies to the level that enables poverty fight a reality. In studies that have been conducted in Kumi by (Wabbi, 2002) only 25% of the farmers were able to adopt the integrated pest management technologies which were being tried on cowpeas. This is very low compared to the (UBOS, 2002) statistics which suggest that over 85% of Ugandan population relies entirely on agriculture. Now we would expect adoption to measure up to 85% as a majority of the population depends on agriculture but it is not the case, one remains wondering how the other 60%(85%-25%) of the population maintains their livelihoods. In Ongino sub county for example, Action Aid carried out a survey in 2010 and found out that about 50% of families couldn't afford two meals a day (Action aid Uganda, 2010).

Kumi district received about Uganda shillings 1.1 billion annually from NAADS program towards farmer support (Kumi DLG, 2011) and yet poverty remained an issue of concern. As the researcher moved deep into villages, he found one or two farmers progressing and even those were not necessarily beneficiaries of the NAADS program. Government in many cases had to bring relief food including 2010 and 2011 when there was just two weeks' flooding (Kumi DLG, 2011). Ideally poverty levels would be low but still the district was among the poorest in Eastern Uganda. The question was; what happened to the technologies and farming knowledge which were procured for farmers under NAADS program? This study sought to find out the factors which hindered agricultural technology adoption.

1.3 Problem Statement

High level of agricultural technology adoption greatly improves agricultural productivity as attested by (Wabbi, 2002) in her study of integrated pest management (IPM) technologies in Kumi district. Adopting IPM would not only lead to better productivity but also minimize the cost of production (Wabbi, 2002). However, agricultural technology adoption still remained very low despite government efforts to improve it. Many farmers continued to do farming traditionally; they were keeping their livestock on free range against improved methods of keeping livestock; broadcast their crops against line planting as recommended by crop production experts, they were not using fertilizer despite declining soil fertility and so on and so forth. This led government to keep trying various approaches to agricultural technology adoption with introduction of the PEAP in 1992, PMA in 1996 and NAADS in 2001. In fact with arrival of NAADS, agricultural technology adoption was expected to increase hence increasing productivity leading to high standards of living in Uganda but this was far from near. Something for sure needed to be done as regards alarming poverty and because agriculture as observed by the (UBOS, 2002) statistics employs more than 80% of Ugandans, the researcher was motivated to investigate this situation.

1.4 Purpose of the study/ General objective

The purpose of this study was to examine the factors which affect adoption of Agricultural Technologies by NAADS farmers in Kumi District with reference to fertilizer use in citrus.

1.5 Specific Objectives

1. To assess the effect of farmers education level on agricultural technology adoption under NAADS program in Kumi district.

2. To explain the effect of political environment on agricultural technology adoption by farmers under NAADS program in Kumi district.
3. To examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district.

1.6 Research Questions

1. What is the effect of education level of farmers on agricultural technology adoption under NAADS in Kumi district?
2. How does the political environment affect agricultural technology adoption under NAADS in Kumi district?
3. What is the effect of extension services on agricultural technology adoption under NAADS in Kumi district?

1.7 Research hypotheses

I. Education level of farmers affects adoption of agricultural technologies by farmers in Kumi district under NAADS program.

II. Political environment affects adoption of agricultural technologies by farmers in Kumi district under NAADS program.

III. Extension services affect adoption of agricultural technologies by farmers in Kumi district under NAADS program.

1.8 Conceptual frame work

The conceptual framework is relationship between the study variables i.e independent variable and the dependent variable represented in the diagrammatic form (Barifaijo et al, 2010). The independent variable is on the left (factors) and dependent variable is on the right (agricultural technology adoption). This relationship means that to achieve agricultural technology adoption, there should be educated farmers, favourable political environment and good extension services.

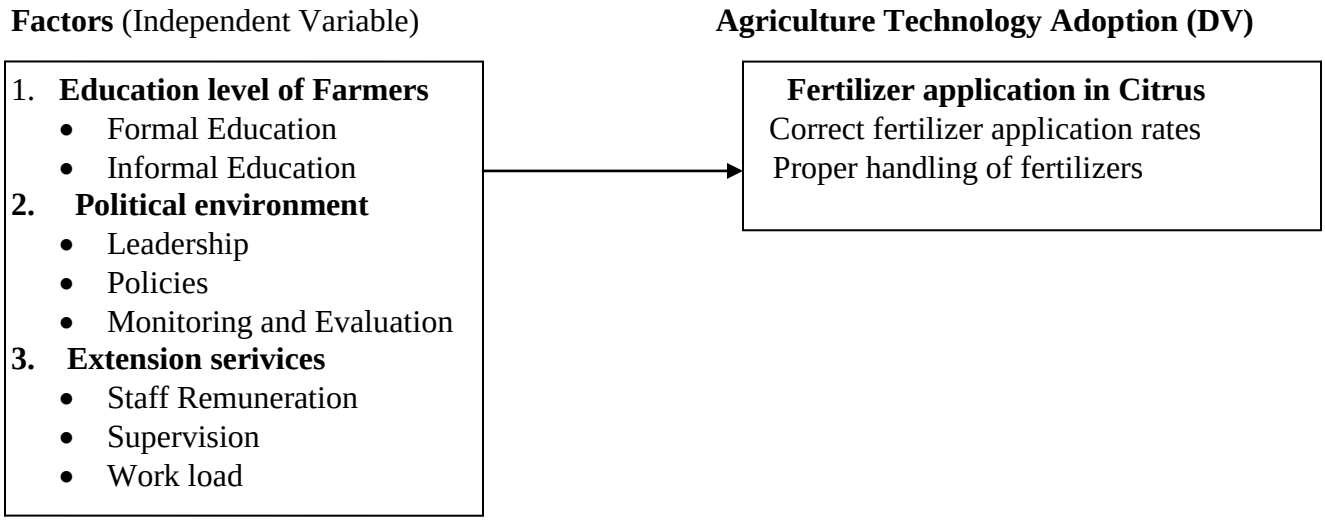

Figure 1: The conceptual framework showing factors effecting adoption of agricultural technologies by farmers

Source: Diffusion of innovations theory adapted and modified.

1.9 Significance of the Study

1. The study may give an insight to various stakeholders who are implementers of agricultural technology adoption programs like NAADS. The stakeholders to benefit may be Politicians, Extension staff, Farmers, funders and any other personalities who may have interest in the subject.

2. The study may guide decision making by all those implementing agriculture technology adoption programs in Kumi district and even other parts of the country.
3. The study may also be used for academic purposes for those who may want to do further research on what challenges exist in Agricultural technology adoption.

1.10 Justification

To begin with, the study was based in Kumi because few people like Wabbi had studied agricultural technology adoption in this district. Wabbi (2002) for example studied integrated pest management on cowpea but her study identified education levels and did not touch political environment and extension services delivery. Kumi is also among the worst hit districts in Teso Sub region in terms of poverty. For example a drought of two months leads to hunger in Kumi. The district also is one with flat terrain after Katakwi and Amuria in Teso, these are the worst hit districts by flooding.

1.11 The scope

1.11.1 Geographical Scope

The study was done in Kumi district in the sub counties of Ongino and Nyero. Kumi district is located in the eastern part of Uganda with the district headquarters located on Mbale to Soroti road. It is about 6 hours drive by bus from Kampala city. Ongino Sub County lies on the eastern part of the district on the shores of lake Bisina whereas Nyero Sub County lies on the western part of the district on your way to the present day Ngora district headquarters.

1.11.2 Content Scope

The content of the study was the factors affecting the adoption of agricultural technologies by farmers in Kumi district under NAADS program but it focused on education levels of farmers, political

environment and extension services as key factors affecting adoption and Fertilizer use in citrus production as the technology of reference.

1.11.3 Time Scope

The research investigated agricultural technology adoption from 2009 to 2012 to cover 3 financial years as these were the most recent years by the time of data collection.

1.12 Definitions of some terms

Agricultural Technology: This can be a physical improved Agricultural input like seed, Irrigation water, Cultivation equipment, etc or Modern Agricultural Knowledge like planting in rows, how to apply Agro chemicals, etc.

Staff Motivation: What drives the staff to work in the context of this study.

Adoption: Transformation from old to new technology.

Fertilizer: A collection of plant nutrients which is applied to soil to give plants better growth.

Agricultural input: An ingredient for Agricultural production

Stakeholders: Persons whose collective effort leads to the success of a program or an event.

Extension: The idea of reaching farmers with agricultural knowledge through trainings

Formal Education: a system of education which leads to a certificate.

Informal Education: a system of education where certificates are not awarded. It usually applies to adult learners.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature on factors affecting agricultural technology adoption in the NAADS program. The researcher read what other researchers had written as regards agricultural technology adoption locally and globally. The chapter helps us to trace how farmers in the past to the present have kept moving with new agricultural technologies and how the adoption rates and levels remained low in many newly introduced technologies. The sources of literature were newspaper articles, academic reports, journals, books and recent publications. The chapter reviews the theory behind this study, farmers' education level, political environment and extension sevices in relation to agricultural technology adoption.

2.2 Theoretical Review

This study was guided majorly by two theories of adoption and these are; diffusion of innovations theory (DOI) and concerns-Based adoption model (CBA). These two theories have their argument based on the theory of change. *Diffusion of Innovations Theory* was arrived at using diffusion concept which was first studied by the French sociologist - Gabriel Tarde in 1890 and by German and Austrian anthropologists - Friedrich Ratzel and Leo Frobenius. In 1995 Everett Rogers, a professor of rural sociology published Diffusion of Innovations. Rogers synthesized research from over 508 diffusion studies and produced a theory for the adoption of innovations among individuals and organizations (Everret Rogers as cited in Orr, 2003).

Rogers (1983) defined diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of

communication concerned with the spread of messages that are perceived as new ideas (Sahin, 2006). An innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption. The characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption (Rogers, 1983). The theory puts four main elements in the diffusion of new ideas and these are: the innovation, Communication channels, Time and the social system. These are key elements which must always be considered before thinking of new technologies for farmers. Rogers further explained 5 stages which a technological innovation passes through and these are: knowledge (exposure to its existence, and understanding of its functions); persuasion (forming of a favorable attitude towards it); decision (commitment to its adoption); implementation (putting it to use); and confirmation (reinforcement based on positive outcomes from it). Rogers went on to explain that the rate of adoption of any innovation/technology is determined by the following characteristics; Relative advantage, Compatibility, Complexity, Trialability, Observability to those people within the social system. Communication, time element and the community must all be in place and positive if the technology has to be adopted. This theory fits into this study because it telling us to consider some key issues it has highlighted before introducing new technologies.

The *Concerns-Based Adoption Model* holds that people considering and experiencing change evolve in the kinds of questions they ask and in their use of whatever the change is (Loucks-Horsley, 1996). Hord et al (2006) observed that the adopters of a technology develop early questions that are more self-oriented; what is it? and how will it affect me? When these questions are resolved, questions emerge that are more task-oriented: How do I do it? How can I use these materials efficiently? how can I organize myself? and why is it taking so much time? Finally, when self and task concerns are largely resolved, the individual can focus on impact. Extension staff can ask: Is this technology working for farmers? and is there something that will work even better?

Usually what fails adoption is rushing on how-to-do-it before addressing self-concerns. The leadership under NAADS focused on farmer's adoption before finding out if extension workers are comfortable with the facilitation materials and strategies to doing it, priority setting, as well as stimulating interest and concern about specific farmer learning (Hord et al, 2006).

The above two theories are saying the same thing using different language. The four key elements and five stages in the adoption process coupled with the characteristics of the technology cited by the diffusion of innovation theory and the eight questions raised in the concerns based adoption model all are saying that people adopt a technology after understanding how it affects their lives; the reason the researcher preferred using both theories. Summarily, the theories tell us that whatever technology we are thinking of adopting, we need to do correct analysis of the situation on ground and applicability of the technology as we are dealing with complex processes which involve a complexity of humans.

2.3 Education level of farmers and agricultural technology adoption.

Education in its broadest, general sense is the means through which the aims and habits of a group of people sustain from one generation to the next (Zaki, 1987). Zaki said that education occurs through any experience that has a formative effect on the way one thinks, feels, or acts. In its narrow, technical sense, education is the formal process by which society deliberately transmits its accumulated knowledge, skills, customs and values from one generation to another, e.g. instruction in schools.

A technology on the other hand is a set of new ideas and adoption is an outcome of a decision to accept a given innovation. Feder, Just & Zilberman (as cited in Wabi, 2002) define adoption as "a mental process an individual passes from first hearing about an innovation to final utilization". Adoption can also be defined as a discrete state with binary variables (Doss, 2003); a farmer either is

an "adopter" or is not. There are many studies that have linked formal Education to technology adoption. Lawal and Oluyole, (2008) in their study of adoption of cocoa technologies in Cocoa Research Institute of Nigeria (CRIN) - Oyo state, observed that only 27% of farmers were adopters and from these, 80% had at least primary level education. Also in Enugu state in Nigeria, the study on cowpea production technologies, 70% of farmers were literate (Agwu, 2002). O'shea (2015) found that educated farmers are more likely to be early adopters and can provide an example to other less educated farmers. Educated farmers tend to prefer modern method of farming whereas farmers with no education were accustomed to traditional methods of farming (Asiedu-Darko, 2014). In his studies, he observed that the level of education was strongly associated with the choice of farming method and could influence their decision to adopt a traditional, modern or a mixture of traditional and modern methods of farming.

Formal education has been seen at the center stage for many aspects of life. During formal education training, one gets to critical thinking; the mindset gets enlarged to accommodate many issues; multitasking develops in someone. In essence, the brain gets better in reasoning. For example if such a brain is given all explanations on how to make Uganda shillings 2 Million from one acre, it will try to follow all the necessary technologies involved to get that money. The practice is that, these farmers will try to implement these agribusiness plans. Krishna, (2011), Uematsu and Mishra,(2010) stated in their studies that Formal Education has a significant positive effect on the adoption of technologies. The more educated the farmers are, the better the adoption rates and levels and so was (Hojo, 2002), (Uaiene et al, 2009) who also put it that the average and minimum years of schooling and the presence of one literate member in the household have positive effects on technology adoption.

However, (Samlowski, 2011) said that farming skills are rarely taught in schools; the skills are taught in the informal classes and so there was no need talking about formal education in technology

adoption. The writer said that many countries neglect informal education sector as they perceive it to play no significant role in the economy and yet the technical skills like the farming skills are obtained through these informal classes. Many a scholar attach value to informal education as it helps many people who missed the formal classes to at least achieve some knowledge which will improve their way of life. Hinzen, (2009) suggested that budget allocation to education sector should be 6% of the gross domestic product and that 6% of this (education sector budget) needed to be allocated for adult education. This priority setting is not very different from (Gartenschlaeger, 2010) who suggested that we must have community centers established to ease adult education. These two scholars (Hinzen, 2009) and (Gartenschlaeger, 2010) said that priority to informal education would improve greatly the skills of every community hence agricultural skills as well.

Adoption studies have been done in many parts of the world with so many controversies but in this particular study the researcher looked at education as the ability to read and write and understand what you are reading and writing. Even in the adult learning classes, these people are still taught how to read and write. The ability to read and write is what is required in agricultural technology transfer because during trainings there will be some pertinent steps/procedures a farmer must take note of otherwise the risk of forgetting is always there in any learning process. The researcher strongly believes that formal or informal education, there should be the bare minimum; *read and write*.

2.4 Political Environment and agricultural technology adoption

Politics (from Greek *politikos* -relating to citizens) as a term is generally applied to the art or science of running governmental or state affairs, including behavior within civil governments, but also applies to institutions, fields, and special interest groups such as the corporate, academic, and religious segments of society(en.wikipedia.org, 2015). It consists of "social relations involving authority or power" and to the methods and tactics used to formulate and apply policy.

Political environment which is conducive positively affects adoption. Baete (2012), in his studies of factors affecting rice adoption in Solomon Islands, found out that farmers did not adopt rice production because of poor leadership, poor infrastructure and bad policies. Leadership was also seen to influence adoption in studies of (Jamsari et al, 2012). Depending on how government sets its priorities, technology adoption may only remain a dream. So if there are problems from leadership to policy then we may see little technology adoption.

In NAADS there have been changing guidelines which was confusing to even implementers; NAADS guidelines have been changing unnecessarily and yet extension workers and farmers are supposed to keep adjusting to these uncalled for abrupt changes. This argument is supported by (Edwards, 2012) who said that having one set of instructions even when they are flawed is preferable to having two sets of perfect directions that when enacted together without reference to each other cause havoc. Good policies and leadership is paramount for any program implementation and depending on the leadership style one usually can guess the outcome. Bwire (2008) observed that whereas there are many factors affecting adoption of technologies, policies geared at improving education system, empowering women, strengthening extension services, appropriate land policy reforms and providing financial support to farmers as well as organized markets would help a lot in promoting agricultural technology adoption. In support of good policies, (Kasirye, 2013) said that as a policy, government would lessen the supply side constraints by introducing a fertilizer subsidy to help develop the local fertilizer market hence facilitate agricultural technology adoption.

Modern political discourse focuses on democracy and the relationship between people and politics. It is thought of as the way we choose government officials and make decisions about public policy. Policies entirely will depend on our leaders. The policies are the ones which move us to the direction we want to go. For example Uganda today has the policy of prosperity for all. The president thinks

that every Ugandan farmer should be able to earn 20 Million per annum from their farms (Government of Uganda, 2008). This is guiding for agriculture professionals but this policy standing in isolation can't achieve results. Other policies like improved agriculture sector funding might need serious consideration before we begin to talk about 20M.

Pande (2005) examined the political economy of coordination in a simple two-sector model in which individuals' choice of agricultural technology affects industrialization. His study compared the economy where mechanized technology was more emphasized than traditional technology and observed that a fully mechanized technology left many people worse off; whereas mechanized economy would be seen to influence agricultural growth, this wasn't the case. Sunding & Zilberman (2000) reviewed the generation and adoption of new technologies in the agricultural sector. They said that public investments in agricultural research and agricultural technologies were paramount in the promotion of agricultural development. Their thinking was that public policy which is geared towards agricultural funding and support would bring real success in technology adoption. Uganda as a country is not yet in this situation as you clearly see the whole agriculture sector getting only about 3.4 % of the total budget (Annual budget, 2012/13).

Some researchers have gone ahead to suggest that the incentives can as well boost agricultural production. The reduction in the call rates for extension staff or just removal of caller fees can for example increase the communication levels between farmers and extension staff. Baumuller (2005) suggested that the increased use of mobile phones would seriously increase adoption rates of agricultural technologies hence improve incomes of farmers.

In Haiti, there has been an active long debate as in many other developing countries, over whether or not the customary tenure system constrains technology adoption and agricultural development, and whether land titling should be among national priorities. Smucker, White, & Bannister (2000)

observed that there was no definitive relationship between tenure and technology adoption by peasants; peasants are preoccupied more by political and economic insecurity than insecure tenure. Their research put it that policy makers should prioritize other more fundamental rural sector reforms than debating on the land tenure system.

Good policies and leadership without follow up of programs to critique the successes and challenges may not give a good picture of the problem. Holland & Ruedin, (2012) observed that monitoring and evaluation is meant to contribute to insights about what does and does not work and why, and should enable program changes that will make donors and partners to keep supporting the program. However, while the fact that politics are part and parcel of M&E has been acknowledged before in the context of projects and programs, it seems that when moving to the sectoral and national level (where interests and stakeholders are multiplied) the interaction among politics and 'M&E' is disregarded (Holvoet & Rombouts, 2008).

From various studies that have been done, one clearly has to relate leadership, policy and monitoring and evaluation with agricultural development. The vague the policies, the poor will be technology adoption and the low levels of output hence the poor farmers. For instance leadership together with staffing and coordination affected the service delivery by 80.2% under the NAADS program (Mwesigwa, 2009).

2.5 Extension services and agricultural technology adoption

Extension services delivery is very paramount for technology adoption. In the studies to find out the effect of extension services on technology adoption, (Asres, 2013) found out that up to 20% of technology adoption was observed in farmers who had attended the extension service classes. The observation was that even if other adoption supporting factors were kept in place and extension

classes were excluded, adoption would be expected to drop. Extension service is a pivot in adoption studies and to talk about adoption without extension classes is like the students being in school without teachers entering their classes. One therefore cannot talk about adoption without extension services as further supported by (Cerdan-Infantes, 2009), (Aker, 2011), (Kondylis et al, 2014) and (Pan et al, 2015). They said that extension service doesn't only improve adoption but also greatly improves the quality and quantity of the farm outcome.

In NAADS, extension service was under looked and priority was put to procurement of inputs for farmers (Government of Uganda, 2011). The guidelines issued by government for NAADS operations gave 80% of the budget to input procurement and only 20% for operations. The 20% was for salaries and facilitating any other operation in the program. The outcome of this budget led to no motorcycles for extension staff and only provided 75,000Ushs for monthly transport to each extension worker, only one extension worker for crop enterprises and another for livestock enterprises (Government of Uganda, 2011). Most stakeholders were not doing what they were supposed to do due to little facilitation because the guidelines were drawn from Kampala to be applied to the whole country meaning the locals' views were ignored.

Sebggala and Okello (2012) said that while the current agriculture extension services delivery system for Uganda under NAADS is supposed to work along the principle of decentralization and privatization hence making extension services more easily accessible and relevant to the small holder farmers and the system more accountable to the end user, it is not happening because the guidelines don't take care of the decentralization. This has led to disorganization in the implementation of the program the reason why extension services were inadequate to farmers and there was less supervision from leaders; sense of ownership still a problem. Implementers are not motivated to doing what they supposed to be doing. For agricultural extension services to be effective there should be adequate

facilitation (remuneration), supervision and enough extension workers which was a problem by NAADS program design.

Like any government department, the employees of production department (extension officers) must be motivated to do their work by providing adequate remuneration. Taylor (as cited in Fercel et al, 2008) in his studies found out that workers who were paid more would produce more; an idea that would benefit both companies and workers. This corresponds to the studies of (Donald, 1998) who found out that an employee is motivated to do his/her work if the working atmosphere gave him/her the sense of achievement, recognition, increased responsibility, promotion or advancement in their careers. This was missing in NAADS because on top of little facilitation, the employees were also not job secure. This is supported by the recent disbanding of NAADS in June 2014 by the president in which the jobs of NAADS employees were abruptly terminated. However, fitting workload, well set goals, praise and criticism of employees, careful handling of agreements and disagreements, capacity building, are also motivators to employees (Thaxton & Graham, 2008), Taylor (as cited in Fercel et al, 2008). All this was missing in NAADS just by program design.

Workload is significantly related to performance of an employee and yet in NAADS there was only one employee for crop enterprises and one for livestock enterprises for the whole sub county; an explanation for poor extension service delivery. Some scholars have done studies related to work load and observed that employees work better if the work load is appropriate (Fercel et al, 2008). In his study of SAS, an American company which increased the number of workers by arrival of improved software in early 2000s as opposed to other big companies which were cutting down numbers to give way for the computer to do more work, (Fercel et al, 2008) observed that SAS's work got better and employees were performing compared to those other companies which cut employees to give way to computer. In practice, the number of staff has never been enough for case of Ugandan extension

service but even the few who are in place are not doing their work the way it's expected. This argument is supported by the study which was conducted in Soroti district on factors affecting the performance of FIEFOC project and was found out that there was need to increase the number of staff for the success of the project (Anino, 2011).

Supervision is very paramount for the success of extension service in Uganda as observed by (Certo, 2006). Supervision is management at the first level of management. Supervision is meant to see that an organization is meeting its goals. Employees in a particular department are performing their jobs such that a department contributes to the overall goals. Supervision focuses on day to day problems and on goals to be achieved in one year or less. Every supervisor needs to have the following skills; technical, human relations, conceptual and decision making (Certo, 2006). Usually the functions of a supervisor are like any other manager's functions which include; planning, organizing, staffing leading and controlling. Donald (1998) also agrees that effective supervision is paramount to success of a program. This was inadequately done in the NAADS program and instead there were accusations due to less-informed leaders and other stakeholders.

2.6 Summary

The subject of technology adoption has been studied by many researchers in various environments suggesting that adoption is influenced by multiple issues. What is true is that most of the researchers have put emphasis of farmer attributes leaving other stakeholders out. This research studied all stakeholders ie implementers and the farmers. The works of Wabbi (2002) for example didn't touch political environment and extension service delivery but more of farmer attributes. Other studies like those of (Chi and Yamada, 2002), (Feder, Just & Zilberman as cited by Wabi, 2002), (Doss, 2003) have all done work as regards technology adoption but much of it relating to farmers' weaknesses.

Formal education as attested by (Lawal and Oluyole, 2008) contributes greatly to agricultural technology adoption. Although formal education takes two dimensions ie formal and informal, this study aimed at putting it that the farmers should be able to read and write in order for them to be able to follow instructions; reason being that agricultural extension trainings require that a farmer writes down some key issues raised hence a demand for education. Educated farmers tend to prefer modern methods of farming whereas farmers with no education are accustomed to traditional methods of farming (Asiedu-Darko, 2014). This tells us that for adoption of new technologies to take effect, the farmers' ability to read and write is essential.

On the other hand, a conducive political environment is ideal for agricultural technology adoption. We need good leadership for us to be able to formulate good policies. Baete (2012), in his studies of factors affecting rice adoption in Solomon Islands, found out that farmers did not adopt rice production because of poor leadership, poor infrastructure and bad policies. Leadership was also seen to influence adoption in studies of (Jamsari et al, 2012). It is therefore pertinent to associate technology adoption with a proper political environment.

Extension service delivery is possible with the presence of right extension staff in numbers and training. It is difficult by all standards to think of adoption if there are no teachers of adoption (extension officers). This is supported by the works of (Asres, 2013) who found out that up to 20% of technology adoption was observed in farmers who had attended the extension service classes. Adequate extension services are attainable if the extension staff is enough, well facilitated and supervised.

The literature reviewed tried to imply that education level of a farmer, political environment and extension services have role to play as regards agricultural technology adoption. As this study sought to address low levels of agricultural technology adoption with emphasis on Kumi district local

government, and also bearing in mind that most of the literature reviewed has been studied from different countries with little so far being done here in Uganda; there was need to investigate this problem after all there were so many errors in the way government program NAADS was being implemented. This literature guided the researcher to what was happening in NAADS program to arrive at conclusions for better guidance of the government programs.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methodology chapter presents the procedure followed by the researcher during data collection, processing and analysis. The chapter is organized in the following order; Research design**,** Study population**,** Determination of the Sample size **,** Sampling techniques and procedure**,** Data collection Methods**,** Data Collection instruments**,** Validity and Reliability, Procedure of Data collection and Data analysis**.**

3.2 Research design

To achieve the objective of the study, a case study cross sectional survey research design was used. Cross sectional studies are relevant in social research as they take shorter periods. The survey approach was used because it has advantages of identifying attributes of a larger population from a small group of individuals (sample). It was not possible to study the whole population of farmers and that is why a survey was inevitable. The above argument is supported by (Mugenda and Mugenda, 2003) who said that the survey is probably the best method available to social scientists and other educators who are interested in collecting original data for the purposes of describing a population which is too large to observe directly. Saunder et al, (2000) identifies another advantage of surveying suggesting that it increases our knowledge about what happens in the study context and it is comparatively easy to explain and to understand. Owens (2002) cited the advantages of survey; its uniqueness, the way it emphasizes probability sampling, how it presents standardization of measurements and analysis of needs. It is unique because the researcher gathers information not available from other sources; probability sampling is emphasized so that there is unbiased representation of population of interest; it talks about standardization of measurements as same

information has to be collected from every respondent and Analysis of needs as survey data is used to complement existing data from secondary sources.

3.3 Study population

The study population was that of Kumi district. Two sub counties were used to collect data; Nyero and Ongino sub counties. The categories of people used to collect data were; the farmers who had benefited from NAADS for the last 3 financial years (2009/10 – 20011/12), technical people, and the political leaders. From the farmers' category, the representative sample was picked basing on the (Morgan and Krejcie, 1970) table. The technical people and political leaders from the two sub counties and the district were interviewed for purposes of triangulation.

3.4 Sample size and selection

It is usually hard to deal with the entire population. Because of this, the researcher selected a sample from the bigger population. A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster as cited in Barifaijo et al, 2010). In this study, the Morgan's tables were used to select the samples especially for farmers' category but for some categories like the technical people and politicians, they were purposively selected. The table below gives us the insight of the categories studied.

Table 1: Categories of respondents studied

Category	Population	Sample size	Sampling Technique	Rationale	Tool used
Farmers	280	162	Systematic Random Sampling	These are technology adopters and it was necessary obtaining primary data from them	Questionnaire/ observation
Politicians	21	21	Purposive Sampling	There was need to interact with key informants for purposes of triangulation	Interview guide
Technical People	24	24	Purposive Sampling	There was need to interact with key informants for purposes of triangulation	Interview guide
Total	325	207			

3.5 Sampling techniques and procedure

In the pursuit of this study the researcher used both probability and non probability techniques. The probability technique also called random sampling was used because it allows for a known probability that each elementary unit will be chosen (Barifaijo et el, 2010); systematic random sampling was preferred compared to other random sampling techniques because there was a data base for farmers (Mugenda and Mugenda, 2003). Sampling using this approach according to Mugenda and Mugenda is by getting the total population and then dividing it by sample thus 280/162 = 1.7 approx 2; it was then easy picking a sample using the interval of 2 farmers. Non random sampling used was purposive sampling because it selected information rich cases for in depth study (Patton as cited in

Barifaijo et al, 2010). The information rich cases were the key informants like the political leaders and technical people.

3.6 Data collection Methods

The methods for data collection used were questionnaire survey, face-to-face interviews, observation, and documentary review.

3.6.1 Questionnaire survey

The questionnaire survey method in this research was used in order to collect important/primary data about the population (Mugenda and Mugenda, 2003). The population of study was that of citrus farmers of Kumi district. It was important to use this method because it is a known social research method. Whittaker and Williamson (2011) said that this method is a preferred source of gathering primary data because it originated from the survey tradition which has a long history of social sciences. That this method is used to study large populations usually using standardized quantitative approach to identify beliefs, attitudes, behavior and other characteristics. In this particular study, a total of 135 questionnaires were received out of 162 questionnaires given out implying 83.3% of primary data was collected.

3.6.2 Interviewing Method

Green and Thorogood (2011) consider an interview as a conversation that is directed more or less towards the researcher's particular needs of data. They said that the data collected from an interview is meant to cover defined data gaps hence its name meaning that not every conversation is an interview. Mugenda and Mugenda (2003) on the other hand define this method as an oral administration of a questionnaire schedule which ends up with a face - to - face encounter; again agreeing with the previous writers. Mugenda and Mugenda said that there is always need to get in

depth data that could have not been possible to get using questionnaires hence the need for this method. There was need to get deeper insights into factors affecting agricultural technology adoption from other stakeholders. There were 14 political leaders and 18 technical people that responded. The political people were selected for this method because these are policy formulators whereby even NAADS program itself resulted from an act of parliament of 2001of the Parliament of the republic of Uganda meaning that it wouldn't be easy to exhaustively study agricultural technology adoption in such a program without considering the role of policy makers (Political Leaders) as key stakeholders. The technical people on the other hand are in the frontline teaching farmers modern methods of farming and so there was need to seek for their opinion as regards the program.

3.6.3 Observation method

In research, it is very important to observe a phenomenon rather than the accounts of it (Green and Thorogood, 2011). The writers (Green and Thorogood) said that observation method is a *gold standard* of qualitative research given that it provides direct access to what people do, as well as what they say they do. This method therefore allows the researcher to record the mundane and unremarkable (to participants) features of everyday life that interviewees might not feel were worth commenting on and the context within which they occur. Observation is therefore the route to knowing people rather than knowing about them. The method helps to collect data at the time it occurs. Mugenda and Mugenda (2003) said that observational method serves to collect objective information as the researcher observes the behavior rather than relying on self-report as the basic source of data. For this study therefore, the method was used to compare between the participants' response to a particular question and what was in the orchard or the environment at that time or the facial expressions. It was used to observe participants during questionnaire survey and interviews.

3.6.4 Documentary review

Documentary review was necessary as it was important to collect some data from the existing documents. Sometimes we may miss information from other methods but come across it while reviewing documents. Green and Thorogood (2011) said that it is always important to do documentary review because digging into a whole range of documents that are relevant to the study will provide information that could have been left out by other methods. There was need to review documents to give a comparison of what had been found in the field. The documents reviewed included; work plans and budgets, reports, minutes, farmer registers, employee files.

3.7 Data collection instruments

The data collection instruments used included; a questionnaire, interview guide, observation checklist, and a document review guide.

3.7.1 Questionnaire

A questionnaire is a structured technique of collecting primary data (Barifaijo et al, 2010). It is generally a series of written questions which the respondents have to provide the answers. This instrument was used in the questionnaire survey method. The instrument helped to collect data from farmers as primary respondents. A primary respondent is a primary source of data because this is the researcher's targeted population of study. In this case a targeted population for agricultural technology adoption was farmers because they are the ones whom the technologies are targeted for therefore must provide primary data. It was structured according to objectives of the study which are education level of farmers, political environment and extension services.

3.7.2 Interview guide

The interview guide also called the interview schedule is a set of questions that interviewer asks when interviewing the interviewees (Mugenda and Mugenda, 2003). It is an instrument used during

the interviews. The interview guide questions were structured just like the questionnaire ie according to objectives. The instrument was used to gather alternative opinions from other groups (political leaders and technical people) to create a rational during data analysis.

3.7.3 Observation checklist

Observation checklist is that list of issues that researcher intends to take note of about particular phenomena (Green and Thorogood, 2011). It is an instrument used to guide the observation. The checklist helped the researcher to compare what was said, with what was observable eg the colour of citrus leaves, knapsack sprayers and measuring cylinders.

3.7.4 Documentary review checklist.

Documentary review checklist is that list of documents that are deemed relevant to the content of the study (Green and Thorogood, 2011). The tool helped the researcher to review those documents that were relevant to the subject of agricultural technology adoption in NAADS such as; farmers' registers, work plans and budgets, procurement plans, employee files, reports and minutes.

3.8 Validity and Reliability

The data collection instruments were examined for adequacy to measure the variables of the study (validity) as well as capability to consistently yield the same results when administered at different times on repeated trials (reliability).

3.8.1 Validity

Validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. This means the data obtained should represent the variables of the study (Mugenda and Mugenda, 2003). Content validity refers to the extent to which items on a measure asses the same content or how well the content material was sampled in the measure (Nunnally and

Bernstein as cited in Achiro in 2013). It means if the instrument being used is not representing the variables of the study, then in that case the data being collected is also invalid.

To check the validity of the instrument, the researcher sought guidance from peers and supervisors. Five draft questionnaires were given to colleagues within the field of research for critical assessment of each item for content validity of the instrument. They were requested to state whether each item is relevant(R) of not relevant (NR).

The content validity index(CVI) was thus computed using logical validity measures based on representatives of the measure by computing the CVI, counting the number of experts who rated the item as relevant or not relevant and dividing the number by the total number of experts. This gave the proportion of experts who deemed the item as content valid. Experts who rated the instrument as valid were 4 and one didn't return the instrument.

Therefore CVI = 4/5 = 0.8, Davis as cited in Achiro (2013) recommends that a CVI of 0.78 or higher for three or more experts could be considered evidence of good content validity. So in this research, we can strongly say that this instrument was valid.

3.8.2 Reliability

Reliability on the other hand is the measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda and Mugenda, 2003). There is more than one method for testing reliability but for the purpose of this study the researcher used internal consistency technique where data is determined from scores obtained from a single test administered by the researcher to a sample of subjects. This is the technique which uses Cronbach's Alpha Coefficient. If the coefficient is more than 0.5 then the instrument is regarded as reliable but ofcourse a figure towards 1 is the best.

3.8.2.1 Pretesting

All instruments were pretested before use. Once the experts within research field had helped in checking the validity of the instruments, the researcher went ahead to administer 5 questionnaires to 5 five respondents before the instrument was used for data collection. More suggestions and corrections from peers were received after the pretest.

Table 2: Reliability analysis on the questionnaire pretest

Variables	Alpha Coefficient	Number of Items
Agricultural Technology Adoption	0.697	18
Education Level of Farmers	0.628	10
Political Environment	0.925	17
Extension sevices	0.527	11
All the four variables above	0.799	64

The instrument was pretested for reliability and overall alpha coefficient was 0.799 which was more than 0.5. The instrument in this case was reliable and the research team went ahead and administered it to the respondents after some few adjustments were made.

Table 3: Reliability analysis on questionnaire after data collection

Variables	Alpha Coefficient	Number of Items
Agricultural Technology Adoption	0.69	26
Education Level of Farmers	0.642	10

Political Environment	0.611	17
Extension sevices	0.542	11
All the four variables above	0.758	64

After the data was collected, the researcher still subjected the instrument to reliability test and the overall alpha coefficient was 0.758 implying that the instrument was still reliable. Usually any figure above 0.5 means that the instrument is reliable hence 0.758 is far beyond thus reliability.

3.9 Procedure of Data collection

The researcher developed the data collection instruments. Pretesting was done to ascertain the validity and the reliability of the instruments. Pretesting was done in another sub county (Kumi Sub County) within Kumi district. After validity and reliability tests were done, the research assistants were recruited to help in data collection. The research instruments were administered to the target respondents to have the data collected. The researcher convened the last meeting with research assistants to share on the qualitative aspects of the study, observations made and other key issues that came up.

3.10 Data analysis

Analysis of data is the process of bringing order, structure and meaning to the mass of collected data (Barifaijo et al, 2010). The purpose of doing analysis is to obtain usable and useful information. It usually involves editing, coding, entering and analysis (Mugenda and Mugenda, 2003). It means that once the correct analysis procedure is not followed, the collected data however accurate may not give

us the correct interpretation. For the purpose of this study, both Qualitative and Quantitative methods of analysis were applied.

3.10.1 Qualitative data analysis

Qualitative data analysis is sometimes ambiguous and can be time consuming and it seeks to make general statements on how categories or themes of data are related. In this kind of research data are in form of text, pictures, materials, etc. Mugenda and Mugenda (2003) described four steps in qualitative data analysis and these are: Data organization, Creation of categories, themes and patterns, Analyzing and interpreting information and finally writing a report. The interview guide data was also checked for completeness; observations made in the field were all checked for completeness to help in qualitative analysis. In this research, the data analysis was done using the steps recommended by Mugenda and Mugenda.

3.10.2 Quantitative data analysis

Quantitative data analysis involves dealing with figures to arrive at meanings. This kind of analysis does its interpretation basing on generalizations for example the 80% of farmers who had adopted technologies were literate. This could mean that the adoption has a relationship with education. Quantitative analysis involves dealing with statistics like the mean, mode, median, standard deviation, the range, etc. Each figure arrived at should usually have meaning. This analysis is based on the computer analysis program called SPSS. Data was collected and processed by editing, coding, analyzing, and summarizing into tables. After checking for completeness was done, the numerical figures were then attached to the responses tables (coding) to help in data processing using the computer (SPSS).

Data was analyzed using the SPSS package version 16. Frequency tables were generated to measure demographic characteristics such as age, sex, etc. T/test was used to show the effects of the IV on the

DV. Pearson's correlation coefficient analysis was used to establish the relationship between variables and linear regression analysis was used to examine the strength of the relationship between the IV and DV. The results from the interviews, observations made and the documents reviewed helped complementing the quantitative data. The qualitative data gave more insight into the study and formed the basis of presentation, analysis and recommendations.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents findings of the study as per the objectives and these are; to assess the effect of education level of farmers on agricultural technology adoption, to explain the effect of political environment on agricultural technology adoption and finally to examine the effect of extension sevices to agricultural technology adoption under NAADS program in Kumi district. The presentation of data starts with pretest analysis and result analysis after data collection presented in chapter three. This was followed with analysis of demographic characteristics of respondents summarized in tables. The results of the descriptive frequencies and percentage distribution on each item were presented according to the research objectives for easy understanding of presentation, analysis and interpretation. The researcher administered 162 questionnaires to respondents and 135 responded giving a response rate of 83.3%, out of 21 expected interviews from politicians, only 14 were successful giving 66.7% and from 24 expected interviews from technical people, only 18 interviews succeeded giving 75 %. The average response rate was 80.7%

4.2 Response rate

The response rate shows participants who answered the questionnaires or interviews divided by the sample size in the study. This is expressed as a percentage. These included farmers where questionnaires were administered, technical people and politicians who were interviewed. The poor response rate reduces sample size and consequently precision. This is a potential source of bias lessening the confidence with which findings can be accepted and generalized (Phelps et al as cited in

Achiro, 2013). The accepted response rate is at least 60% and any figure above this is even much better (Fincham, 2008).

Table 4: Response rate

Category of respondents	**Population**	**Sample size**	**Response**	**Response Rate**
Farmers	280	162	135	83.3
Politicians	21	21	14	66.7
Technical People	24	24	18	75
Total	**325**	**207**	**167**	**80.7**

The above table illustrates the categories of respondents that were studied. There were three categories studied; farmers whose response rate was 83.3%, the politicians whose response rate was 66.7% and the technical people whose response was 75%. The overall response was 80.7% meaning the study was successful as this is good enough a number as proposed by (Fincham, 2008) i.e above 60% being a good percentage.

4.3 Demographic characteristics of respondents

This section includes the quantifiable characteristics of the respondents; Age, Gender, Physical Ability Status, Health status, Family size and Farming experience in years. The purpose of studying demographic characteristics is premised on an assumption that low agricultural technology adoption levels are either associated to these characteristics or not so that the conclusion is clear.

4.3.1 The sub counties of respondents

The sub counties of Nyero and Ongino were used in this research for the categories of farmers. The target number of sub counties was two; one in the western part of the district (Nyero) and one in the eastern part of the district (Ongino). For interview purposes, the district headquarters was included as the third entity. The purpose of bringing the district headquarters on board was to inform the findings of the questionnaire as much as possible by interviewing political leaders and technical people. Also the purpose of including all these categories of people and areas was to minimize error as much as possible through triangulation.

Table 5: Respondents by Sub County

Sub county	**Respondents**
Nyero	76
Ongino	59

The majority of respondents were from Nyero taking 56.3% of the total respondents. 43.7% came from Ongino sub county. This was good enough in terms of representation.

4.3.2 Age of respondents

Age usually informs decisions. As the old adage goes'' wisdom comes with age'', the researcher was interested in finding out if a farmer's age had an effect on agricultural technology adoption. The farming assumption here was that, the younger population does not own properties such as land on which farming takes place and yet as the population gets too old, ability to do farming diminishes. The age of respondents was categorized in the table below.

Table 6: Respondents by age distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30 years	13	9.6	9.6	9.6
	31-40 years	41	30.4	30.4	40.0
	41-50 years	44	32.6	32.6	72.6
	51 years & above	37	27.4	27.4	100.0
	Total	135	100.0	100.0	

In the table above, the findings of the study indicate that 13(9.6%) of the respondents were in the age bracket of 18-30 years, 41(30.4%) were in the age bracket of 31-40 years, 44(32.6%) were in the age bracket of 41-50 years and 37(27.4) were above 51 years. The younger farmers (below 30 years) were very few and also older famers (above 51 years) were still few. The majority of farmers were middle age (30-50 years) which is an ideal farming age. This implies that a majority of farmers trying to adopt agricultural technologies are of the right age (strong and energetic and at least owning land). This is a good direction as regards technology adoption. We were having the right population involved in agricultural technology adoption and yet not much was seen on ground. During observation, the orchards of the younger farmers and older farmers were worse of compared to those of middle age farmers. It was convincing to say that age had a relationship with agricultural technology adoption.

4.3.3 Gender of respondents

This is the sex of the respondents and the researcher sought to establish weather sex had an influence on agricultural technology adoption. The assumption is that a majority of farming resources such as land and capital in Uganda are owned by males. It is expected that the majority of farmers are

therefore men. The researcher as well included this information in the questionnaire which was administered and the results are summarized in the table below.

Table 7: Respondents by Gender distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	94	69.6	69.6	69.6
Female	41	30.4	30.4	100.0
Total	135	100.0	100.0	

The results above clearly indicate that there were more male respondents than the females despite random sampling methods being utilized in selection of respondents. 94(69.6%) of the respondents were male and only 41(30.4%) were female. This means there are more male farmers than female farmers. Citrus being a commercial crop, explains why the majority of the farmers are male. Men own land and other properties and so you expect more male farmers than female. Whereas the males own fields, it was observed that women and children were the ones doing donkey work in the fields. The implication here is that there will be less agricultural technology adoption because the owners of the farms (men) were not common in their fields and yet they are the ones attending meetings and trainings.

4.3.4 Physical Ability Status

Physical ability status means that a farmer is either disabled or not. Farming requires that someone is physically fit (not disabled) so that he/she can carry on with ease. The researcher included this in the questionnaire. The table below summarizes the disability status of respondents.

Table 8: Respondents by Disability distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disabled	13	9.6	9.6	9.6
	Not Disabled	122	90.4	90.4	100.0
	Total	135	100.0	100.0	

From the table above, 13(9.6%) of the respondents were disabled and 122(90.4%) were not disabled. The implication here is that there were more persons without disability and fewer with disability in the farming environment. Disability affects farming negatively as some technologies don't take care of disabled persons. From the table above 90.4% of the respondents were not disabled meaning that a majority of the farmers are able to carry on with farm activities. Even in the field the orchards of the disabled were worse of compared to those of the non-disabled implying that the technologies being propagated are not pro disabled. In both Ongino and Nyero sub counties, the Knap sack sprayers procured for farmers were only for the non-disabled, the training venues were also at one point in every parish. All these could have affected the disabled hence poor agricultural technology adoption.

4.3.5 Health status

The study also sought to establish the health status of respondents. The assumption here is that the healthy farmers are the ones which are able to carry on easily with farming. The researcher's interest was to find out whether the health status of the respondents had any effect on agricultural technology adoption. This was included in the questionnaire and the results are summarised in the table below.

Table 9: Respondents by health status distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Has a chronic illness	20	14.8	14.8	14.8
	Has no chronic illness	115	85.2	85.2	100.0
	Total	135	100.0	100.0	

From the table above, 20(14.8%) of the respondents had chronic illness and 115(85.2%) had no chronic illness. It is therefore important to observe that a majority of the respondents (85.2%) had no chronic illness. To do farming, one must be healthy. The healthy farmers had fair fields compared to the non healthy ones. This means that the health status of an individual has an effect on agricultural technology adoption; after all you will rarely find people with chronic illnesses being able to farm.

4.3.6 Family size

Family size means the number of individuals per household. In this piece of work, the researcher was interested in finding out if the family size had an effect on agricultural technology adoption. The researcher implied that larger families provided labour to the farm hence improve on adoption. This was included in the questionnaire and the table below summarises what was obtained at data collection.

Table 10: Respondents by family size distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5 family members	37	27.4	27.4	27.4
	6 family members and above	98	72.6	72.6	100.0
	Total	135	100.0	100.0	

The above table has it that 37(27.4%) of the respondents had the family of 0-5 members and 98(72.6%) of the respondents had the family size of more than 6 members. This shows that a majority of the respondents had bigger family size implying that labour was available. Availability of labour leads to technology adoption because it is easy to tryout any new idea as man power is available. Most respondents confessed that lager family was good for labour but lamented that it was also hard taking care of the lager family. It can be implied here that the larger the family, the easier it is to try out the new idea hence technology adoption.

4.3.7 Farming experience in years.

The study sought to establish how many years a farmer had been in the farming business. The intension was to observe that more years of farming meant easy implementation of the new agricultural technologies. The table below summarises the results.

Table 11: Respondents by farming experience distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-3 years	50	37.0	37.0	37.0
	4-6 years	66	48.9	48.9	85.9
	7-9 years	15	11.1	11.1	97.0
	10 years and above	4	3.0	3.0	100.0
	Total	135	100.0	100.0	

From the table above, 50(37%) of the respondents had 0-3 years of farming experience, 66(48.9%) had 4-6 years farming experience, 15(11.1%) had 7-9 years of farming experience and only 4(3%) had above 10 years of farming experience. These results show that as the farming experience grew, the number of respondents went declining. This was the most disturbing result from the demographic characteristics. Instead of more respondents increasing with increasing farming experience it was instead declining. It may mean that there was no relation between farming experience and agricultural technology adoption. Further interaction with farmers and observations made revealed that the NAADS farmers were always complaining and accusing the implementers. They complained of lack of market for their produce and so many abrupt changes in the guidelines.

4.4 Empirical Findings

The study examined the factors affecting the adoption of agricultural technologies by NAADS farmers in Kumi district, the case of fertilizer use in citrus crop. Three hypotheses of the study were set and these were; Education level of farmers affects adoption of agricultural technologies by

farmers in Kumi district under NAADS program; Political environment affects adoption of agricultural technologies by farmers in Kumi district under NAADS program and the last being extension services affects adoption of agricultural technologies by farmers in Kumi district under NAADS program.

To test the hypotheses, the researcher therefore presented empirical evidence using the descriptive analysis in percentages distribution and linear regression analysis (T-test) according to the study objectives which gave the evident nature of relationship between the variables and the extent to which each affects or contributes to the other.

4.4.1 Objective 1: To assess the effect education level of farmers on agricultural technology adoption

This objective was set to assess education as one of the factors that affect the way agricultural technologies were adopted under the NAADS program in Kumi district. The objective was measured in two dimensions; formal education and informal education. The results were obtained after administering questionnaires to the respondents (farmers) from the two sub counties (Nyero and Ongino). The results are presented in the following subsections below.

4.4.1.1 Descriptive analysis on the relationship between education level of farmers and agricultural technology adoption

This objective was meant to measure education and agricultural technology adoption accordingly in two dimensions; formal and informal education. This was obtained using the questionnaires. The researcher wanted to find out how education affected the adoption of agricultural technologies. It should be noted that technology adoption in this particular research was tested using S.4. Most of the

technical and political persons interacted with said it was easy working with people who had reached S.4. One of the elderly extension officers was quoted saying;

> ‘*’these days people reach P.7 when they can’t read and write properly but during our time, a P.7 person was just sharp. For you to think that a P.7 person can do anything is a waste of time; if even some S.4s today can’t speak fair English’’.*

This was how most extension workers had observed it; that it was easy working with farmers whose education level was S.4 and beyond probably because the Ugandan population has perceived UPE to lower education standards. Questions that sought the farmers’ education level were asked thus the results below.

Table 12: Famers who studied up to P.7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	85	63.0	63.0	63.0
	Agree	11	8.1	8.1	71.1
	Disagree	7	5.2	5.2	76.3
	Strongly Disagree	32	23.7	23.7	100.0
	Total	135	100.0	100.0	

The farmers who strongly agreed that they had gone up to primary seven were 85 (63%), those who agreed to have reached P.7 were 11 (8.1%) and 39 (28.9%) didn’t go up to primary seven. This

means that a majority of farmers went up P.7. Since our yardstick was S.4 the researcher went ahead and measured farmers who had reached S.4 in their formal education.

Table 13: Famers who studied up to S4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	49	36.3	36.3	36.3
	Agree	4	3.0	3.0	39.3
	Disagree	4	3.0	3.0	42.2
	Strongly Disagree	78	57.8	57.8	100.0
	Total	135	100.0	100.0	

The farmers who strongly agreed that they had gone up to senior four were 49 (36.3%), those who agreed had reached S.4 were 4 (3%) and 60.8% didn't go up to this level. This means that a majority of farmers didn't reach senior four in their formal education. When further questions were asked, 26(19.3%) farmers had reached S.6, 18(13.3%) had attained a diploma and only 2(1.5%) had a degree.

From the above results ie tables 12 and 13, the researcher observed that the education level of farmers is low with only 36.3% having reached senior four. A majority of farmers hadn't moved far with formal education. When the field visits were conducted the researcher observed that most of the orchards of those farmers who had reached S.4 were better than those orchards whose owners had not reached S.4. On further interaction with farmers with their education up S.4, it was observed that they knew how to apply fertilizer, what pesticides to buy and how to apply these pesticides; they knew

how to mix and apply agricultural chemicals. The extension workers said that they were confortable working with farmers with at least S.4 education. They further said that these farmers (S.4 and above) took note of techniques they taught and that in the next training session, it was those farmers who reminded everyone of where they had stopped in the previous class. This therefore implied that the extension workers found it easy working with farmers whose education was at least S.4. this argument is supported by (Lawal and Oluyole, 2008) who found that of the 27% of farmers who were adopters, 80% of them had at least primary education.

Despite government effort to improve life through farming, the results above tell us that adoption is still very low. The results above explain that farming business has been left for people who haven't gone far with education. The educated people find themselves occupying offices; the reason why very few Ugandans past S.4 are involved in farming. This also explains why farming is subsistence in Uganda as less knowledgeable people are the ones doing it. What was even more fascinating was that a majority of extension workers confessed during interviews that they were not practicing farming; they only taught it.

Table 14: Famers who Attended to FAL classes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	3	2.2	2.2	2.2
	Disagree	14	10.4	10.4	12.6
	Strongly Disagree	118	87.4	87.4	100.0
	Total	135	100.0	100.0	

Only 2.2% had attended FAL classes whereas the other majority (97.8%) didn't attend FAL classes.

The farmers denied having access or attending FAL classes but during interviews with technocrats, it was revealed that FAL classes were available at Parish level. The technical people further said that even adoption trainings had very few farmers attending them and so it was not wise to believe them (farmers) that there were no FAL classes. The extension workers said that the farmers only waited for inputs and that there was no need attending to trainings because they had been farming all their lives. A majority of politicians sided with farmers that indeed there were no FAL classes at the Parishes; some sort of mismatching information but what the result shows is that there was no attendance in the FAL classes. This therefore implies that adoption may remain a myth because the FAL class as another avenue for those who missed formal education to improve on their writing and reading skills is not taken seriously. The researcher observed the laziness transferred to agricultural training classes hence the reason for low technology adoption.

4.4.1.2 Correlation analysis on the Relationship between Education and Agricultural Technology adoption.

The idea behind correlation analysis was to find out the relationship between the variables as indicated in the table below

Table 15: Correlation analysis on the Relationship between Education and Agricultural Technology adoption

		Agric Tech Adoption	Education
Agric Tech Adoption	Pearson Correlation	1	.080
	Sig. (2-tailed)		.354
	N	135	135
Education	Pearson Correlation	.080	1
	Sig. (2-tailed)	.354	
	N	135	135

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

The results in the above table indicate that education level of a farmer significantly affects Agricultural Technology Adoption with a correlation of .080(**) at $p < .345$. If Ho: No relationship between education and Agricultural Technology Adoption and H1: there is relationship between education and Agricultural Technology Adoption, it means that result from above table tells us to reject Ho, and accept H1 based on the statistically significant value of .080 which is positive and below +1. The type of relationship is weakly positive in a linear sense based on Pearson correlation coefficient of .080(**) which is also less than +1(strongly positive). The result is in tandem with descriptive analysis confirming that indeed there is a relationship between education and agricultural technology adoption. The implication of this result is that increase in formal education level leads to improvement on agricultural technology adoption.

4.4.1.3 Regression analysis on the relationship between education and Agricultural Technology adoption

Linear regression was used to further ascertain the results. It should be noted that regression analysis indicates the direction of a relationship between two variables. In linear regression, R squared also known as Coefficient of determination is used to see how the data are close to the fitted line. Coefficient of determination represents the amount of the variation of the data presented by the dependent variable that is explained by the independent variable. R squared should therefore be between 0% and 100%. Where 0% means the data are not related to the fitted line hence no relationship between the variables and a figure above 0% can explain closeness of the data to the fitted line hence the relationship between variables. In this analysis a linear regression analysis was done and results presented in the table below.

Table 16: Regression analysis on the relationship between education and Agricultural Technology adoption

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.080[a]	.006	.000	1.13897

Predictors: (Constant), Education

In testing the objective that education level of farmers affects Agricultural Technology adoption, the value of the coefficient of determination, also known as R squared was 0.6 %. This result is above 0% and it explains the relationship between the variables (education and agricultural technology adoption). This implies that there is a relationship between education and agricultural technology

adoption hence the former affects the later. In this case, the percentage explanation of the magnitude of the relationship is low. The results were further explained by the t-test.

Table 17: T-test analysis of the relationship between education and Agricultural Technology adoption

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.362	.202		11.710	.000
	Education	.048	.051	.080	.931	.354

a. Dependent Variable: Agric Tech Adoption

With the t-test value on formal education of 0.931 significant at p-value .354, the t-test explains the effects on the dependent variable, taking note that the t statistic can help to determine the relative importance of each variable in the model, putting much concern on t value of 0.931 which is well above p-value, implying that education level of farmers affects agricultural technology adoption. In this case, the p- value of .000 means that; reject Ho and accept H1 which states that education level of farmers affects agricultural technology adoption.

4.4.2 Objective 2: To explain the effect of political environment on agricultural technology adoption

The purpose of this objective was to explain the effect of political environment on agricultural technology adoption under the NAADS program in Kumi district. The objective was measured in three dimensions; Leadership, Policies and Monitoring and Evaluation. The results were obtained after administering questionnaires to farmers from the two sub counties (Nyero and Ongino). The results are presented in the following subsections below.

4.4.2.1 Descriptive analysis on the relationship between political environment and agricultural technology adoption

This objective measured the relationship between political environment and agricultural technology adoption in three dimensions; Leadership, Policies and Monitoring and Evaluation. This was obtained using the questionnaires. The description was done per question because the researcher wanted to know the effect of each item. The findings are presented below.

Table 18: Farmers' response to Leadership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	1.5	1.5	1.5
	Agree	42	31.1	31.1	32.6
	No Comment	10	7.4	7.4	40.0
	Disagree	59	43.7	43.7	83.7
	Strongly Disagree	22	16.3	16.3	100.0
	Total	135	100.0	100.0	

From table 18 above, only 1.5% of the farmers strongly agreed that the political leadership of NAADS was relevant to the program. 31.1% agreed that leadership was good and the other 67.4% either having no comment, disagreeing or strongly disagreeing (refer to table 18). When further questions were asked relating to how leaders talked about NAADS program, the farmers said it wasn't good and also affirmed that the relationship between the technical people and politicians, was a bad one. NAADS as any other government program was supposed to be implemented by technical

people but all the relating decisions and policies as regards its implementation come from political leaders. The above result totally tells us that, there was a leadership problem as regards NAADS implementation. The implication here is that there was confusion on leadership; infighting between technical people and leaders which gave no chance in having clearly guided farmers hence low technology adoption.

Table 19: Farmers' response to Policies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	1	.7	.7	.7
	Agree	23	17.0	17.0	17.8
	No Comment	7	5.2	5.2	23.0
	Disagree	82	60.7	60.7	83.7
	Strongly Disagree	22	16.3	16.3	100.0
	Total	135	100.0	100.0	

Table 19 above illustrates the farmers' views as regards policies relating to the NAADS program especially the guidelines. Only 1 (0.7%) of the farmers strongly agreed that the NAADS guidelines were favourable, 23 (17%) farmers agreed in favour of the guidelines, 7 (5.2%) had no comment, 82 (60.7%) disagreed and 22 (16.7%) strongly disagreed on fairness of the NAADS guidelines. In fact the vast majority as indicated lamented on the ever changing guidelines and changing of the extension workers. They even didn't understand the guidelines. According to the interviews to the technical people, they also agreed with farmers that the guidelines had become a nuisance to them. One extension officer was quoted saying;

''how can you keep on printing new guidelines for us (extension workers) without telling us what has happened to the previous guidelines and its impact to farmers; they don't even consult us when changing guidelines; the guidelines are made from Kampala and sent for us to implement, how; it is they themselves (leaders) who have failed NAADS''.

This implies that even if the guidelines were good, the farmers' and extension officers' perception of the program guidelines was negative meaning that it is not possible to talk about agricultural technology adoption in this kind of confusion.

Table 20: Farmer' response to Monitoring and evaluation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	1.5	1.5	1.5
	Agree	32	23.7	23.7	25.2
	No Comment	7	5.2	5.2	30.4
	Disagree	43	31.9	31.9	62.2
	Strongly Disagree	51	37.8	37.8	100.0
	Total	135	100.0	100.0	

From table 20 above, only 2 (1.5%) of the farmers strongly agreed that their leaders monitored the activities of the NAADS program, 23.7% of the farmers agreed that their leaders monitored the program, 7 (5.2%) had no comment, 43 (31.9%) disagreed and 51 (37.8%) strongly disagreed that their leaders monitored the program. According to the documents reviewed, success of the program required monitoring as part of it but in this case the researcher observed that there was not much

monitoring being done. The implication is that, since there was very little follow up of the activities of the extension workers, it led to laxity of the extension workers hence a possible low agricultural technology adoption. Monitoring and evaluation as a political environment aspect therefore affected the adoption of agricultural technologies as it was not adequately being implemented.

4.4.2.2 Correlation analysis on the Relationship between Political Environment and Agricultural Technology adoption.

The idea behind correlation analysis was to find out the relationship between the variables as indicated in the tables below. The analysis was still based the three dimensions of the political environment ie Leadership, Policies and Monitoring and evaluation.

Table 21: Correlation analysis on the Relationship between political environment and Agricultural Technology adoption

		Agric Tech Adoption	Political Envt
Agric Tech Adoption	Pearson Correlation	1	.196*
	Sig. (2-tailed)		.022
	N	135	135
Political Envt	Pearson Correlation	.196*	1
	Sig. (2-tailed)	.022	
	N	135	135

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

The results in the above table indicate that the political environment significantly affects Agricultural Technology Adoption with a correlation of .196(**) at $p < 0.05$(.022). If Ho: No relationship between

political environment and Agricultural Technology Adoption and H1: there is a relationship between political environment and adoption, it means we reject Ho and accept H1 which states that there is relationship between political environment and Agricultural Technology Adoption based on the statistically significant value of .196 which is below +1. The type of relationship is weakly positive in a linear sense based on Pearson correlation coefficient of .196(**) which is also less than +1(strongly positive). The results here rhymed with results from descriptive analysis again confirming that political environment when improperly managed affects agricultural technology adoption. This implies that the improvement in political environment leads to improvement in adoption of agricultural technologies.

Further correlations between Agricultural Technology adoption and Policies and also with monitoring and evaluation still revealed that indeed there was a relationship between political environment and agricultural technology adoption. The tables below confirm that.

4.4.2.3 Regression analysis on the relationship between political environment and Agricultural Technology adoption

Linear regression was used to further ascertain the results. It should be noted that regression analysis indicates the direction of a relationship between two variables. In this analysis a linear regression analysis was done and results presented in the table below.

Table 22: Regression analysis on the relationship between political environment and Agricultural technology adoption

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.196[a]	.039	.031	1.12044

a. Predictors: (Constant), Political Environment

In testing the objective that Political environment affects agricultural technology adoption, the value of the coefficient of determination also known as R squared in this study amounted to 3.9%. The coefficient of determination represents the amount of the variation of the data presented by the dependent variable that is explained by the independent variable. If the value of R squared should be between 0% and 100% and R squared in this result is 3.9%, it means the two variables ie political environment and agricultural technology adoption have a relationship; in this case a positive one as illustrated by regression results. This result means that the data plotted for both variables is close to the line of best fit hence the percentage explanation of the magnitude of the relationship. The results were further explained using the t-test below.

Table 23: T-test analysis on the relationship between Political Environment and Agricultural Technology Adoption

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.853	.307		6.032	.000
	Political Environment	.197	.085	.196	2.309	.022

a. Dependent Variable: Agricultural Technology Adoption

With the t-test on political environment of 2.309 at p-value .022, the t-test explains the effects on the dependent variable, taking note that the t statistics can help to determine the relative importance of each variable in the model, putting much concern on t value 2.309 which is well above p-value, implying that political environment affects agricultural technology adoption. In this case, the p-value of .000 means that; reject Ho and accept H1 which states that the political environment affects agricultural technology adoption.

4.4.3 Objective 3: To examine the effect of extension services on agricultural technology adoption

The purpose of this objective was to determine the effect of extension services on agricultural technologies adoption under the NAADS program in Kumi district. The objective was measured in three dimensions; remuneration, Supervision and work load. The results were obtained after administering questionnaires to farmers from the two sub counties (Nyero and Ongino). The results are presented in the following subsections below.

4.4.3.1 Descriptive analysis on the relationship between extension services and agricultural technology adoption

This objective was meant to measure effect of extension services on agricultural technology adoption accordingly in three dimensions; remuneration, supervision and work load. This was obtained using the questionnaires. The description was done per question because the researcher wanted to know the effect of each item. The findings are presented below.

Table 24: Farmers' response to Remuneration of extension workers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	3.0	3.0	3.0
	Agree	29	21.5	21.5	24.4
	No Comment	16	11.9	11.9	36.3
	Disagree	61	45.2	45.2	81.5
	Strongly Disagree	25	18.5	18.5	100.0
	Total	135	100.0	100.0	

From table 26 above, only 3% of respondents strongly agreed that the extension staff were well facilitated, 21.5% agreed that the extension staff were well facilitated, 11.9% had no comment, 45.2% disagreed and 18.5% strongly disagreed. This result means that the extension workers don't have all they need to go to the field and get work done as farmers said that extension workers were using public transport. This result is substantiated by the response from extension workers and political leaders that the extension workers actually didn't have motorcycles for transport. They said

getting to the field was difficult. Extension workers said that only the NAADS coordinators were given motorcycles. The extension workers said they only got 75,000ushs as transport refund and this was supported by documents reviewed implying that capacity building of farmers was really a very hard job to do. One of the extension officers was quoted as asking;

> ‘’*how can someone pay you a salary and doesn’t facilitate you to go to the field and expects good results?*’’

The result above means that there is less presence of extension staff in the field due to poor remuneration. The less presence of extension workers in the field means less interaction between farmers and the extension staff therefore possible low agricultural technology adoption.

Table 25: Farmers’ response to supervision of extension workers by leaders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	8.1	8.1	8.1
	Agree	22	16.3	16.3	24.4
	No Comment	44	32.6	32.6	57.0
	Disagree	44	32.6	32.6	89.6
	Strongly Disagree	14	10.4	10.4	100.0
	Total	135	100.0	100.0	

The respondents who strongly agreed that extension workers were well supervised were only 8.1%, 16.3% agreed that extension workers were well supervised, 32.6% had no comment, 32.6% disagreed and 10.4% strongly disagreed. From this result, there is very little supervision done on the extension

workers by their superiors like the sub county NAADS coordinator, the sub county chief and political leaders. Less supervision implies that the extension workers went to the field when they wanted; the training programs could have not been followed, the complaints were hard to reach leaders of the program from farmers and many other issues associated with farmers' agricultural skills. Since supervision is expected to affect technology adoption in a positive manner meaning increased supervision leads to increased technology adoption, there was low adoption in this particular scenario due to low supervision. The farmers further accused the coordinators of not keeping in touch with them so that they air out their views.

Table 26: Farmers' response to Number of extension workers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	1.5	1.5	1.5
	Agree	8	5.9	5.9	7.4
	No Comment	5	3.7	3.7	11.1
	Disagree	73	54.1	54.1	65.2
	Strongly Disagree	47	34.8	34.8	100.0
	Total	135	100.0	100.0	

From the table above, only 1.5% of the farmers strongly agreed that the extension workers were enough in number, 5.9% were in agreement, 3.7% had no comment, 54.1% disagreed and 34.8% strongly disagreed. When asked further, most farmers said they received an extension worker once in two months or not at all. The low extension worker to farmer ratio means that very few farmers access agricultural technologies such as skills in time. The few farmers who get these skills in time

are the ones already practicing farming and are able to follow up with extension officers as opposed to the majority of farmers who may not have timely access to an extension worker. The few extension workers here implies that farmers can't access agricultural skills in time as there is always a long queue hence low agricultural technology adoption expected. Too few extension workers, too few results hence low levels of agricultural technology adoption. This result was confirmed by the interviews from technical people and politicians. The politicians and the technical people all said that there was only one officer for crop related enterprises and one officer for livestock related enterprises and none on fisheries as well as apiculture enterprises.

4.4.3.2 Correlation analysis on the Relationship between Extension services and Agricultural Technology adoption.

The idea behind correlation analysis was to find out the relationship between the variables as indicated in the tables below.

Table 27: Correlation analysis on the Relationship between extension sevices and Agricultural Technology adoption

		Agricultural Technology adoption	Extension Services
Agric Tech adoption	Pearson Correlation	1	.164
	Sig. (2-tailed)		.058
	N	135	135
Extension Services	Pearson Correlation	.164	1
	Sig. (2-tailed)	.058	
	N	135	135

The results in the above table indicate that the Extension services significantly affected agricultural technology adoption with a correlation of .164(**) at $p < 0.058$. If Ho: no relationship between extension services and agricultural technology adoption and H1: there is relationship between extension services and Agricultural Technology Adoption, we reject Ho and accept H1 because the correlation value is 0.164 which is positive and below +1. The type of relationship is positive in a linear sense based on Pearson correlation coefficient of .164(**) which is also less than +1(strongly positive).

4.4.1.3 Regression analysis on the relationship between Extension services and Agricultural Technology adoption

Linear regression was used to further ascertain the results. Regression analysis indicates the direction of a relationship between two variables. In this analysis, a linear regression was done and results presented in the table below.

Table 28: Regression analysis on the relationship between Extension services and Agricultural Technology adoption

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.164[a]	.027	.019	1.12730

a. Predictors: (Constant), Extension services

In testing the objective that Extension services affects agricultural technology adoption, the value of the coefficient of determination, also known as R squared was 2.7 %. Coefficient of determination represents the amount of the variation of the data presented by the dependent variable that is

explained by the independent variable. The value of R squared should be between 0% and 100% and R squared in this findings is 2.7%; it means the two variables ie extension services and agricultural technology adoption have a relationship; in this case a positive one as illustrated by correlation results. This result also means that the data plotted for both variables is close to the line of best fit to that percentage (2.7%) hence the percentage explanation of the magnitude of the relationship. The results were further explained by using the t-test.

Table 29: T-test analysis on the relationship between extension services and Agricultural Technology Adoption

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.980	.302		6.562	.000
	Extension Services	.170	.089	.164	1.912	.058

a. Dependent Variable: Agricultural Technology Adoption

With the t-test value on Extension services of 1.912 at p-value .058, the t-test explains the effects on the dependent variable, taking note that the t statistics can help to determine the relative importance of each variable in the model, putting much concern on t value 1.912 which is well above p-value, implying that Extension services affects agricultural technology adoption. In this case, the p- value of .000 means that; reject Ho and accept H1 which states that the Extension services affects agricultural technology adoption.

4.5 Findings from Interviewing, Observation and Documentary review methods

4.5.1 Findings from interviewing method

In this method, a series of questions were administered to key informants particularly technical people and Political leaders. This method was intended to bring deeper insights into factors affecting agricultural technology adoption because questionnaires targeted only farmers; it was important to get views from the implementers of the program. It was also purposed to compare what the farmers said with what came out of people in charge of the NAADS Program.

4.5.1.1 Interview findings from technical people.

The technical people said that the inputs were always given in time for most enterprises and that they went to the field to train farmers on better farming practices. They said that they did all they could to ensure that the farmers adopted the new farming methods. They however accused farmers of being lazy; that farmers always said that the inputs are a reward to them for voting their leaders to offices. When asked whether farmers practiced better farming practices like fertilizer application, extension workers said that was far from near. They said that the farmers accused them of giving fewer inputs and yet the president always sends more inputs.

When asked about education level of farmers, they said a majority of farmers were illiterate (over 80% illiteracy), something they think makes their work even much more harder. They confessed that it was very easy to work with a few farmers whose education level was past S.4. Extension workers further said that even the attitude change was easy with educated farmers. One of the extension workers during interviews was quoted as saying;

‘’I am tired of these illiterates stressing me on things they just hear from politicians. Infact people failing NAADS are politicians because they just tell lies to farmers in favour of votes. They don’t tell farmers the trueth and yet they know a majority of people are illiterate’’.

On the side of political environment, the technical people accused the politicians of failing the NAADS program. They said the politicians are the reason why the farmers never took agricultural technology adoption as something that would better their lives because politicians said different things every day. The worst part technical people said was that of changing NAADS guidelines every now then and all this was tagged to leadership problems. They accused political leaders of altering NAADS agenda to suit their interests and still blame them (technical people) whenever things didn’t work out.

Looking at the extension services, the technical people said that there was no transport provided for extension workers in form of motorcycles. They said extension officers were given only 75,000 Ushs as transport refund for a whole month. This money they said was very little to keep someone in the field for one month. The technical people also said there was only one service provider for crop enterprises and also one for livestock enterprises and yet sub counties were too large to even move around and finish in one month. These issues raised by the technical people were serious and this could explain why adoption of agricultural technologies remained very low.

4.5.1.2 Interview results from political leaders.

The political leaders in aspects like education and remuneration tended to agree with technical people except in the following areas; they accused the technical people of being corrupt; that they (technical people) never gave farmers what they deserved in terms of inputs; that some extension workers didn’t even go the field. Generally the researcher found that there was finger pointing by the implementers

of the NAADS program (technical people and political leaders). It was a finger pointing arrangement in detriment of the farmers' agribusiness path hence low agricultural technology adoption.

4.5.2 Results from observation

This method of data collection was used to allow the researcher to use his naked eyes and other body senses to see, internalize and compare the difference between what the farmers said with what actually was in their orchards. Sometimes there is a tendency for respondents to enter into the mind of the researcher to guess the most likely responses he/she would want to hear. So this approach brought that aspect of comparing what the respondent was saying with what the researcher was seeing. The key observations made were that; some of the farmers who said that they were following the modern farming practices in their fields like fertilizer use had their orchards saying something else; the trees were not healthy as said by the owners and had pale green leaves and stunted; a sign of less nitrogen in the soil. The researcher found in most cases poorly managed orchards with pale green leaves, pests and diseases, poorly planted orchards, etc. Also the farmers didn't know how to apply fertilizer hence the reason for pale green vegetative part of the trees. This means that during research, not everything said is accurate implying that in this particular piece of work, some of those farmers who said that they were practicing fertilizer application and other modern methods were not doing so as the observation method revealed otherwise. This means even low adoption levels registered in documents could be far less.

4.5.2 Results from documentary review

The purpose of documentary review was to find out what the existing documents such as NAADS guidelines, employee files, work plans and budgets, reports, minutes of meetings, farmer registers, training programs and communications contained as regards NAADS implementation. What caught researcher's eye was that much as guidelines were in place in both sub counties, the copies were for

the sub county NAADS coordinator, sub county chief and the chairperson LC III. This clearly meant that this document was in few hands implying that there was little access by many. The training programs were not in place in both sub counties implying that the extension officers trained when and where they wanted. The researcher again discovered that some farmers who were appearing in the farmers' registers as having received the technologies were not having or practicing these technologies in their fields; some farmers denied having received citrus seedlings and yet their names appeared in the registers; a possible reason for less than 100% response rate. Further interaction with their neighbours revealed that indeed those farmers had received seedlings but failed to manage and all seedlings dried up in the fields. Some farmers received less inputs compared to what was in the registers. The implication here is that the farmers' adoption of technologies was exaggerated in documents as opposed to what was in the field; Also the missing documents such as training programs signify poor training patterns; The few copies of the guidelines means that very few people had access to the way the program was being implemented hence adoption levels were being compromised. These documents in simple terms implied there was low agricultural technology adoption.

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section presents the summary, highlight of the discussions arising from the findings thus arriving at the conclusions and the recommendations for policy makers, NAADS stakeholders and academicians to use when need arises. Limitations, contributions and areas for future research were also integrated in this section.

5.2 Summary of the findings

The findings of the study as evident in chapter four portrayed that Agricultural Technology Adoption was being affected by Education level of farmers, Political environment and extension services in Kumi district. This was confirmed by the data which was collected by all the four methods ie questionnaire survey, interviewing, observation and documentary review conducted in the sub counties of Nyero and Ongino in Kumi district. The descriptive, correlation and regression analysis of the data reported more empirical evidence of the existence of the relationship. The results are summarised per objective below.

5.2.1 Objective 1: To assess the effect of education level of farmers on agricultural technology adoption under NAADS program in Kumi district

Under this objective, the researcher found out from the data collected that only 39.3% of the farmers had reached S.4 in their studies. Although this result is lower according to interviews from technical and political people (about 15%), the researcher discovered that a majority of the farmers were illiterate. When the regression analysis was performed, the relationship between education level of

farmers and agricultural technology adoption was positive implying that increased education level of farmers leads to increased agricultural technology adoption.

Data from FAL attendance shows that only 2.2% of the farmers accepted to have attended these classes; again explaining low adoption of technologies because a farmer's attendance of these classes would also improve his/her reading and writing skills hence agricultural technology adoption.

5.2.2 Objective 2: To explain the effect of political environment on agricultural technology adoption under NAADS program in Kumi district

In this objective, the findings were evident that political environment affects agricultural technology adoption in all the three dimensions ie leadership, policies and monitoring and evaluation. Only 32.6% of farmers agreed there was good leadership in the NAADS program, 17.7% of farmers agreed the guidelines were favourable and 25.2% of farmers agreed that the politicians were following up on how the program was being implemented right from the sub county to the farmers' fields. The farmers didn't see a good relationship between technical people and political leaders; in fact some farmers said the two categories kept fighting each other. The regression results showed that the relationship between political environment and agricultural technology adoption was stronger compared to the other two factors ie education level of farmers and extension services. The relationship was a positive one still implying that improving the political environment in which the NAADS program runs currently would imply improving agricultural technology adoption. The results clearly indicated that the current political arrangement doesn't favour technology adoption taking into consideration the education level of our farmers. It is very clear that there is some sort of mixing of issues and hence confusing the arrangement further.

5.2.3 Objective 3: To examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district

Arising from the findings, it's evident that extension services had significantly affected the agricultural technology adoption. The regression analysis clearly showed that there was a relationship between extension services and agricultural technology adoption. This relationship was also positive. Famers further confirmed these findings thus only 24.5% agreed that the extension staff were well facilitated to do their work, 24.4% agreed that the extension officers were well supervised and only 7.4% agreed that the extension workers were enough in numbers.

5.3 Discussions of the findings

Under this section, the researcher looked into detail the findings of the study. The idea behind this chapter was to attach more meaning to the findings of the study and also the researcher's opinions. It was also handled objective by objective.

5.3.1 Objective 1: To assess the effect of education level of farmers on agricultural technology adoption under NAADS program in Kumi district

The findings of the study revealed that 39.3% of the farmers had reached S.4 which implies that this is a group of farmers that is able to read and write what they understand. For someone to be able to change him/herself, he/she should understand what they are doing (concerns based adoption model) hence technology adoption. This argument is in line with work which was advanced by (Lawal and Oluyole, 2008) which stated in their study of the 27% adopters that 80% of them had attained atleast primary seven education. This argument was further supported by (Krishan, 2011) and (Uematsu and Mishra, 2010) that education level of farmers has an effect on adoption of technologies. The researcher agrees with this line of argument because the research findings have also revealed that

educated farmers were the ones practicing new technologies which were being promoted in the NAADS program. There was a positive relationship between formal education and agricultural technology adoption implying that improving education level of farmers also improves adoption of technologies. What however seemed lacking in those researches was the other aspect of education which is informal as conducted by Samlowski, (2011). Samlowski contradicted with formal education researches and put it that there was no link between formal education and technology adoption. Instead he discovered that actually informal education was at the center stage of adoption because adoption studies are conducted in informal classes. For this particular piece of work, the researcher found out that there was a relationship between education and agricultural technology adoption.

In the researcher's view point, a farmer may not find adoption studies in formal classes but the beauty behind this nature of studies (formal) is mindset widening meaning that such a brain can now accommodate upcoming tasks. This doesn't mean that it is automatic that everyone who has been to formal education classes can easily pick technologies, no; but there is generally a manner in which a formal educated person prefers taking life to the next level; seriously this category of people are dreamers which may not necessarily be the case with a person who has not been to formal classes. The insights one gets from formal classes already prepare him/her for dreaming. However, going to a formal class alone doesn't lead to adoption of whatever nature if this person doesn't go to pick the skills hands on as required by the particular technology. It is actually true that agricultural technology adoption classes are very informal meaning that even if you are a professor, you have to put that aside and head to an informal class to pick a particular skill of your interest. Education helps farmers to easily understand the skills being passed to them. The extension workers explained to the researcher

that a farmer who is educated can easily apply fertilizers, mix pesticides and many other tasks given to them hence adoption of agricultural technologies.

5.3.2 Objective 2: To explain the effect of political environment on agricultural technology adoption under NAADS program in Kumi district

Political environment should be conducive for effective delivery of services to citizens; if it is not conducive you expect bad leadership, poorly formulated policies and lack of monitoring and evaluation of government programs. The findings of the study revealed that political environment positively affected agricultural technology adoption under NAADS program when the correlation analysis was done.

Good leadership is expected from politicians for program success but the study revealed that there was weak leadership as only 32.6% of the farmers agreed that the leadership was relevant to NAADS program. Some farmers accused leaders of fueling confusion on the way the program was being implemented. The bad leadership that has eaten up the NAADS program is what has led to poor adoption of technologies because extension workers were not given clear direction to follow. These results tend to agree with the findings of (Edwards, 2012) where he suggested that good leadership in any program implementation becomes paramount for its success. There should be someone to guide others irrespective of whether the guidance is dictatorial or democratic. Edwards picked a quote from Napoleon ‘’ One bad general does better than two good ones’’. The implication to this according to Edwards was that better have one idea to follow than having too many good ideas at the same time. The researcher agrees with Edwards as the findings of the study revealed that indeed there was bad leadership in NAADS. It is better to have an idea, implement it and evaluate yourself before you can move to another idea; this was not there in NAADS; one leader comes up with an idea but before it is

implemented, more ideas are beaming for the same purpose. Better we do something we are sure of instead of harrying everywhere at the same time hence the reason technology adoption in NAADS has not been taken seriously.

According to how NAADS has run in the past few years of its existence, the policies have changed so many times. The guidelines change year in year out according to documentary review conducted. This according to implementers has been a disaster to extension system because as extension officers are still adjusting to a set of instructions, another set is brought. The researcher observed that abrupt changes in policies which were orchestrated by weak leadership have given rise to low agricultural technology adoption. Farmers don't even understand guidelines because they said there was no need after all as you try to adjust to a set of guidelines another was brought. There were also accusations on fund mismanagement in NAADS which diverted the farmers' minds hence the farmers were taken up following who had stolen what, instead of being in their farms taking care of their technologies.

The accusations that existed between the technical people and the politicians paralyzed the extension system. These two kept pointing fingers at each other instead of focusing on the livelihoods of local people. The researcher found out that agricultural technology adoption was just a myth in the current arrangement of NAADS. Infact the accusations moved from bad to worse with disbanding of NAADS in July 2014 by the president (the President's speech on 3rd June 2014 at Namugongo shrine). This was how a well thought program like NAADS (refer to Chapter 1) met its end. By the time of writing this piece of work, the Ugandan farmers were yet pondering what was next for them. The researcher strongly believes that every idea that affects the nation is either propagated or destroyed depending on the existing political environment.

The study further revealed that only 25.2% of farmers agreed that their political leaders followed how the NAADS program was being implemented by technical people. This tells us that there was poor

monitoring of the program. According to (Holland and Ruedin, 2012), monitoring and evaluation is meant to contribute to insights about what works and doesn't work and why and should enable program changes that will make donors to keep supporting the program. In NAADS this aspect was also weakly implemented meaning there is no follow up of technologies hence misuse of those technologies and therefore poor adoption of those technologies

5.3.3 Objective 3: To examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district

Extension services affect agricultural technology adoption as attested by (Asres, 2013). Once the extension services are well conducted, adoption levels are expected to improve. To conduct extension services, we need the staff which is working in the conducive atmosphere unlike the confusing environment where NAADS program was running. It is expected that once an employee is appointed to his/her job, a job description is given with its associated resources to achieve those tasks. It is also expected that the appointing authority should apportion appropriate workload and do adequate supervision of the appointees for fulfillment of organization's objectives.

Good remuneration will lead to improved output by the workers (Taylor as cited in Fercel et al, 2008). Taylor observed that workers who were well facilitated and well paid did more work. This was lacking in NAADS hence low technology adoption. This was not the case in the NAADS extension service and instead there was controversy; the extension staff lacked motorcycles, many said their salary was little compared to their workload. The farmers also said that the extension workers were not well facilitated to do their work as they (extension workers) cited lack of motorcycles which the farmers said the reason extension staff always gave whenever they arrived late.

There was little supervision done by leaders and farmers said that extension workers went to work when they wanted meaning there very little being done. Certo, (2006) described supervision as management at the first level of management. He said that supervision should be done daily if the organization's goals are to be met. The researcher discovered that there was very little supervision being done in the NAADS program. The analysis done found a positive relationship meaning that improve supervision and staff performance will be improved hence increased agricultural technology adoption.

The number of extension workers was small ie only one per department and all other stakeholders said the same; they said the problem was that there was only one extension worker per department for an entire sub county. Technical people in Ongino Sub County for example said that one extension officer wouldn't cover 16 parishes (36 villages) even in one month meaning there was always work carried forward implying that to cover the whole sub county required a longer time hence farmers always complaining. This is in agreement with the works of (Achiro, 2011) where she also found out that one of reasons FIEFOC project was not succeeding in Soroti was due to few extension workers. From the results of this study and other researches that have been done, the researcher agrees that indeed the workload of the organization should always correspond to the number of workers for better output.

During interviews with technical people, the researcher observed that the serious issues that really affected them were lack of transport, larger areas to cover and mistrust by the political leaders. The extension services become an issue of policy. Extension workers should have been among the priority areas to make ensure they are doing their work. The researcher strongly believes that if extension services delivery is not given priority, then talking about agricultural technology adoption is like expecting milk from a cow one doesn't feed. Seriously speaking there is no way adoption can be

realized without paying attention to workers. There was a positive relationship between extension services and agricultural technology adoption according to the analysis done which means improving the extension services would as well improve the level of agricultural technology adoption and vice-versa.

5.4 Conclusions

In this section, the researcher concluded his findings objective by objective.

5.4.1 Objective 1: To assess the extent to which education level of farmers affects agricultural technology adoption under NAADS program in Kumi district

Basing on the that fact the evidence from the research findings points that education level of farmers positively affects agricultural technology adoption in Kumi district, and considering the views of researchers like (Lawal and Oluyole, 2008), Krishan, 2011) and (Uematsu and Mishra, 2010) who all discovered in their studies that education level affects technology adoption, the researcher therefore concludes that increase in level of education leads to improvement in adoption of agricultural technologies. The above scholars associate education with widening of someone's capacity to handle tasks; education makes someone to be able to read and write and to understand what they are reading and writing. This ease of apprehension of tasks makes it simpler for adoption of agricultural technologies to become a reality.

5.4.2 Objective 2: To explain the effect of political environment on agricultural technology adoption under NAADS program in Kumi district

Considering the findings of the study which put it that agricultural technology adoption was being affected by the political environment, and also considering what scholars like (Edwards, 2012) who

put it that there should be effective leadership for program success, (Holland and Ruedin, 2012) who put it that there must be effective monitoring and evaluation for success, it is now logical to conclude that a good political environment where there is effective leadership, well formulated policies and monitoring and evaluation will lead to high levels of adoption of agricultural technologies.

5.4.3 Objective 3: To examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district

In consideration of the findings of the study which revealed that the working conditions of the extension staff were not friendly, and looking at the views of scholars like (Fercel et al, 2008) and (Donald J.S. ,1998) who all said that a conducive working conditions would improve the output of employees and also the President of Uganda's speech during the budget speech day on 11th June 2015 where he associated failure of government programs to failure of political leaders to supervise civil servants; it must be concluded that a well-managed extension service system leads to improved agricultural technology adoption. There was clearly poor remuneration, poor supervision and much workload per extension officer and it was not surprising that agricultural technology adoption remained low despite attempts to have it improved.

5.5 Recommendations

This section presents the recommendations object by objective.

5.5.1 Objective 1: To assess the extent to which education level of farmers affects agricultural technology adoption under NAADS program in Kumi district

Basing on the fact that a majority of the farmers were illiterate, the researcher recommends that the FAL classes be strengthened at parish and village levels so that the farmers can improve their reading

and writing skills which are a requirement in the NAADS trainings. This will enable them to follow instructions during trainings like mixing pesticides. Still on the issue of illiteracy of farmers let there be gradual introduction of technologies ie from where farmers are to where we want them to be. This extension principle was largely ignored under NAADS in the sense that any new idea leaders feel is good is introduced without considering we are dealing with an illiterate population. The researcher thinks that NAADS program be implemented with this bearing in mind. Before you think about promoting inorganic fertilizers for example, do the farmers appreciate it or do they even know how to locally utilise available organic fertilizers so that by the time you introduce inorganic fertilizers, they already understand the basics; you see this was missing.

The researcher further recommends that let the user friendly technologies be introduced like making fertilizer locally like organic fertilizers and while trying out these technologies the farmers should be organized into groups to improve cohesiveness.

5.5.2 Objective 2: To explain the effect of political environment on agricultural technology adoption under NAADS program in Kumi district

Considering that there was ineffective leadership in NAADS program, lack of clearly formulated guidelines, ineffective monitoring and evaluation; and yet these were very important for the success of the program and that our leaders were lacking in them, the researcher recommends that the leaders be trained in these areas to enhance their leadership skills, policy formulation skills and monitoring and evaluation skills. When this is done it will to lead to effective leadership, well formulated policies/ guidelines and effective monitoring and evaluation hence effective service delivery.

5.5.3 Objective 3: To examine the effect of extension services on agricultural technology adoption under NAADS program in Kumi district

In view of the fact that extension services delivery is not done the way it is expected to be because the working atmosphere of the extension workers is not conducive for their work; there is poor facilitation, lack of supervision from leaders and too many farmers to reach to, the researcher recommends that the extension workers be well facilitated to do their work for example procuring of the motorcycles for them. The researcher further recommends that let there be meaningful supervision in the NAADS program. Ineffective supervision has led to accusations between leaders and technical people which crippled the program further. The researcher further recommends that more extension workers are recruited to suit the farmers' numbers.

5.6 Limitations to the study

This study is limited to the following;

Geographical scope; the selected area of the study was only limited to Ongino and Nyero sub counties of Kumi district.

Time scope; the time considered for this study is only limited to 3 financial years (2009/10 – 2011/12).

Content scope; the study was limited to fertilizer application in citrus. It was further limited to only three study variables ie education level of farmers, political environment and extension services. This means that if another researcher used different content, he/she may come up with different results altogether.

Research design; this piece of work is limited to a case study cross sectional survey research design. This means that a different output may be got if another research design is used.

5.7 Contributions of the study

The study contributed the following;

The study contributed to the body of knowledge of technology adoption/transfer.

The study provided knowledge that education has a big implication on technology transfer. It has explored what education can do to technology adoption. The study reveals that education makes someone to be able to read and write hence ability to take notes on issues being raised by the extension officer for example application rates of fertilizers.

The study further provided knowledge that a healthy political environment is ideal for technology adoption. If there is good leadership coupled with good policies and monitoring, then technology transfer becomes a reality. In this case there was confusion to the extent that leaders didn't know their roles; it came out clearly that the politicians misused their authority to the point that extension workers were failed from doing their work. Political finger pointing led to the disbanding of NAADS in June 2014 by His Excellency the President of the Republic of Uganda.

This study is unique to citrus crop in Kumi district. Other researchers could have done work in technology adoption but this one is unique to this crop.

The study also informs the general public that unless agricultural technology is considered as something that employs a majority of citizens, agricultural technology adoption is far from near and poverty is here to stay and stay indeed.

The findings of this study formed a basis for further research with respect to low adoption levels of agricultural technologies.

5.8 Areas for further researcher

The following are possible areas for further research;

The government strategies/policies that can lead to improved adoption of agricultural technologies hence reduce poverty levels in the country. One can consider investigating the best ways government can employ to improve agricultural technology adoption.

This very study can be redone in a different geographical area. The study may give a different result if another geographical area is used.

This study can be redone using different content as this one was limited to fertilizer application in citrus.

One can change the study variables and come up with different results as this one was limited to only three ie education level of farmers, political environment and extension sevices.

Also redoing this study with another research design could end up with something unique. The study applied a case study cross sectional survey research design and it may mean that a different output may be got if another research design is used.

The researcher further puts leadership styles and adoption as another area for further research. One could investigate how the leadership styles could affect adoption of agricultural technologies.

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