IMPACT OF THE NATIONAL ACCELERATED AGRICULTURAL INPUTS ACCESS PROJECT ON MAIZE PRODUCTION; A CASE OF ITABUA SUB LOCATION, EMBU WEST DISTRICT, KENYA

BY;

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DECLARATION

This research project report is my original work and has not been presented for a degree in other university

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DEDICATION

This work is dedicated to my Parents, my Late Dad Raphael K Njurai and my Mum Gladys Wambui.

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ABSTRACT

Small holder maize production depends on access to agricultural inputs, extension services and information on production and markets. Production of maize in Kenya has been declining for the last two decades due to lack of access to improved seeds and fertilizers among other factors. This has resulted in low farm productivity, food insecurity and unavailability for many house holds in Kenya. The purpose of this study was to investigate the impact of the three components of the National Accelerated Agricultural Inputs Access Program on maize production in Itabua sub location of Embu West district and recommend areas of improvement in future. The objectives that form the basis of this study were to; assess the extent to which access to inputs impacted on maize production; examining level to which access to information on the programme impacted on maize production; examining the level to which access to extension services impacted on maize production. This study was a descriptive research limited to a population of 300 small holder farmers who were beneficiaries of the program in 2007 in Itabua sub location. A sample size of 30 farmers from this population was interviewed after systematic random sampling. The research instruments used were a questionnaire consisting of structured and semi-structured questions and analysis with assistance of Statistical Package for Social Scientists. The findings are that the program, impacted on maize production increased to the extent that average maize yield improved by 24% from a mean of 2.7 bags per acre in 2006 to a mean of 3.3 bags per acre in 2007. In the season the project was implemented the percent of farmers who harvested less than 5 bags reduced from 26 (86.6%) in 2006 to 20(66.7%). On the other hand, the percent of those who harvested over 5 bags in 2006 more than doubled from 13.3% to 33.3% in 2007. The program also impacted positively on availability of maize as a food .The number of extra months maize as a food was available after harvesting increase for all 30(100%) of respondents. However no family reported sale of surplus maize through groups hence they could not buy inputs as a group as was planned. From the findings, it was concluded that the three components of the program access to inputs, access to information and access to extension messages impacted positively to some extent in maize production in the short run. However, it did not have a long term impact on maize production. This is because harvests were not adequate for sale. There were therefore no proceeds for subsequent purchase of inputs the next season as was planned. From the findings and conclusions, the researcher recommended that the government continues supporting inputs access programs and providing program information and extension messages through groups. The government should also link the groups to credit service providers and continue providing subsidized inputs through National Cereals and Produce Board stores. Farmers should explore crop inputs insurance schemes while researchers should carry out trials on use of EMCO maize variety that can be recycled.

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ABBREVIATIONS AND ACRONYMS

AGMARK- Agricultural Market Development Trust

CAN –Calcium Ammonium Nitrate top dressing fertilizer

CIG- Common Interest Group

CIMMYT -International Maize and Wheat Improvement Centre

CRDS- Centre for Rural Development and Self help

DAEO- Divisional Agricultural Extension Officer

DAO- District Agricultural Officer

DAP- Diamnonium Phosphate planting fertilizer

€- Euro the European Union currency

EU -European Union

FISP -Farm Inputs Subsidy Programme of Malawi

Ha – area of land in hectares

IAAE -International Association of Agricultural Economists

IRMA -Insect-Resistant Maize for Africa a project under CIMMYT

KARI- Kenya Agricultural Research Institute

Kg- weight in kilograms

MOA –Ministry of Agriculture

MT- weight in metric tones

NAAIAP -National Accelerated Agricultural Inputs Access Project of Kenya

NALEP-National Agricultural and Livestock Extension Program

NARO- National Agricultural Research Organization of Uganda

NCPB –National Cereals and Produce Board

NPK- Compound fertilizer containing Nitrogen, Phosphorous and Potassium

SRA- Strategy for Revitalizing Agriculture

USA- United States of America

US$- Currency in United States of America dollars

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Maize farming is an important agricultural activity both in the developed and developing world. Maize serves as a source of food for mankind, livestock fodder and provides raw materials for industry. However farmers engaged in maize production the world over have at one time or the other faced challenges that result in low income from the enterprise. Respective governments have intervened to cushion the farmers from the impacts of low income.

Among the options that governments have pursued are subsidy programs. Agriculture subsidy programs aim at stabilizing food prices, ensuring plentiful food production, and guaranteeing farmers' basic incomes. In order to promote the production of maize, developed countries have put in place product subsidy policies to protect their farmers from competition from other world producers.

In the United States of America (USA) small farm subsidy programs existed in the 19th century. However widespread subsidies began in the 1930's under then President Franklin D. Roosevelt. The Roosevelt administration offered subsidies to farmers to alleviate the effects of the Great Depression, which had sent agricultural commodity prices crashing around the world. Originally, the government intended subsidies to be only a temporary program, but they have remained in place decades after the Depression (EU, 2010).

In Europe in 2010, the European Union (EU) spent €57 billion on agricultural development, of which €39 billion (68%) was spent on direct subsidies. Agricultural and fisheries

subsidies formed over 40% of the EU budget. Since 1992 (and especially since 2005), the EU's Common Agricultural Policy has undergone significant change as subsidies have mostly been decoupled from production. The largest subsidy is the Single Farm Payment. (EU, 2010).

Self-sufficiency in food grains has been a publicized goal of government policy in many developing countries. Among various alternatives to achieve this goal, two policy options, output price support and input subsidy, both characterized by the government intervention into market pricing, are evaluated by applying a simple demand-supply model to the Philippine's rice economy. The results demonstrate a possibility that a subsidy applied to modern inputs, such as fertilizer, that are being used below optimum can be more beneficial than supporting product prices (Randlph & Hayami, 1976).

In Asia and particularly in India, the approach to food security has been through inputs subsidy for farmers. This has led to the country producing adequate food for its large population and even availing some for export. The role of fertilizer in agricultural development has been widely recognized and is well documented by (Sahota, 1968).

In the 2004/2005 agricultural season, the government of Malawi initiated the Farm Inputs Subsidy Programme (FISP). The programme provided subsidized inputs for maize among other crops to poor farmers. This has resulted in improved food security at household level and increased maize surplus at national level as evident from the 0.5 million Metric Tonne (MT) surplus in 2005/06 season, and 1.3 million MT in 2006/07 seasons, respectively. As a result, in 2007, Malawi began selling more maize to the World Food Program of the United Nations than any other southern Africa country (Kachule & Chilongo, 2007). Malawi started

exporting hundreds of thousands of tons of maize to Zimbabwe. This was specifically because of increased yields from less than 1 MT per Ha up to 2.04 MT per Ha, growth and expansion of private sector business, creation of competition amongst players, increased use of technologies; and increased per capita use of inputs (fertilizer and seed). The success of this project led to the initiation of similar programs in 2008 in neighboring countries of Lesotho, Mozambique, Zambia and Swaziland. Kenya also initiated a subsidy programme from 2007 in selected districts of the country (Luhanga & Sungani, 2007). Small holder farmers in Kenya have been facing decline in food production due to lack of access to improved seeds and fertilizer. The reduced access has been due to increased prices of these key inputs leading to a situation where fertilizer and improved seeds are rarely used.

Annual maize production in Kenya stands at 2.3 million MT produced from 1.5 million tones per hectare at an average grain yield of 1.5 MT per Ha (Pingali, 2001). This is not adequate for the growing population and shortfalls are met by imports. Growth rate in agriculture is low due inadequate use of technology while growth rate in maize production is also low, and negative averaging negative 1.3% during the 1988-99 periods (Pingali, 2001). The situation is made worse by low production mainly caused by drought, declining natural resources base, losses due to weeds, stem borers and weevils in storage. (Mugo, Songa, DeGroote, & Hoisington, 2002).

In 2007, the Kenyan Ministry of Agriculture (MOA) started implementing the National Accelerated Agricultural Inputs Access Project (NAAIAP). This programme has been running for the last four years since then (GOK, 2007). NAAIAP 's vision is to be a lead programme of facilitating farm inputs access and affordability by small holder farmers for

improved food security and poverty reduction. The program's primary objective is to improve maize production through improved access to farm inputs, extension services and information on production and marketing for small holder farmers. NAAIAP targets 2.18 million small holder farmers in 45 districts with the entry point being groups approach for extension service delivery (GOK, 2007). NAAIAP has two approaches.

One was an inputs grant component (Kilimo Plus Starter Kit) that targets small holder farmers who own less than one hectare of land. The farmers were mobilized into Common Interest Groups (CIGs) from where extension messages on maize production and information about the program were provided. Later after the trainings, the group members were provided with basic inputs to cover 1 acre of maize- (fertilizer and seeds). It was planned that after the beneficiaries' harvest their maize, they were supposed to market the surplus grains through the CIG cereal bank. This will specifically be through a Receipt Warehouse System that was to be used to finance the group's subsequent inputs requirements. It was hoped after being able to purchase subsequent inputs on their own; this will catapult the beneficiaries out of the vicious low production-low income-low input access- low yields cycle (GOK, 2007).

The other approach, commercial small packs (Kilimo Biashara Package) targeted farmers who are already involved in economically viable enterprises but are constrained by lack of access to inputs. This category accesses inputs with credit acquired by their registered groups from Equity Bank and repays after they harvest and sell their produce (GOK, 2007). In this approach, the farmers were mobilized into groups, trained on crop husbandry and the

desired results. They accessed their inputs from local agro dealers and developed linkages on future undertakings.

1.2 Statement of the Problem

A problem is a question of concern that can be answered through data collection (Mugenda & Mugenda, 2003). A problem is also a question worth investigating. Even though maize is an important food and cash crop in Kenya (GOK, 2002); (Nyoro, Kiiru, & Jane, 1999), its yields fell from over 2 MT in 1982 to below 1.5 MT per Ha in 2000. This is due to lack of access to hybrid seeds and fertilizers in the last one decade (Ouma, DeGroote, & Owuor, 2006). This has resulted in low production, food insecurity and unavailability for many households in Kenya (GOK, 2002). Small holder farmers are caught in the low productivity-lower income-lower fertilizer and inputs use vicious cycle resulting in food insecurity and poverty (GOK, 2007). In the mean time, the government occasionally allows importation of maize to plug the deficit occasioned by low production. Importation requires foreign exchange and leads to exportation of jobs. This serves as a short term measure that is not sustainable.

The Kenyan government through MOA has been implementing NAAIAP for the last four years in selected districts of Eastern, Central, Rift valley and Western provinces to address the maize production challenges of the small holder farmers. The government has spent Kenya shillings 1 billion in the last four years on NAAIAP (GOK, 2007). In 2010, maize production is reported to have increased by 46% from 27 million bags in 2009 to 38.5 million bags in 2010 due to a combination of factors like increased area under cultivation, favorable weather conditions, and improved access to fertilizer and up scaled access

distribution of maize seed through the inputs support programs implemented by MOA including NAAIAP (GOK , 2007). However, it's still not documented to what extent the NAAIAP has impacted on maize farming in the areas it has been implemented.

1.3 Purpose of the Study

The purpose of this study was to investigate the impact of NAAIAP on maize farming in Itabua sub location of Embu West district

1.4 Research Objectives

The study was guided by the following objectives

1. To assess the extent at which access to inputs impacted on maize production in Itabua location
2. To examine the level at which access to information impacted on maize production in Itabua Location.
3. To examine the level at which access to extension services has impacted on maize production in Itabua location.

1.5 Research Questions

This study addressed the following research questions

1. To what extent has access to inputs as a component of NAAIAP programme impacted on maize production in Itabua location?
2. To what level has access to information impacted on maize production in Itabua Location?

3. To what level has access to extension services impacted on maize production in Itabua location?

1.6 Significance of the Study

This study is significant at household, farmers' institutional, and policy makers' levels within the central and county government levels. It is hoped that the study will benefit stakeholders at implementation levels. It should also benefit project planners at the MOA.

The findings of this study have provided information that will be beneficial to policy makers at national and county levels. This will be specifically on policies on improved maize production.

Research institutions and universities may also benefit in this study .The findings of this study may inform research institutions and universities. It will assist researchers and planners of agricultural projects on the important considerations needed when planning and executing such projects and where such projects are being carried out. exit strategies. The findings of the study have recommended to researchers what knowledge and technology gaps still exist and need addressing.

It is hoped that community institutions like CIG's, micro finance institutions and produce consumers may also benefit from these findings. This is because they may be interested in offering linking with CIG's, offering extension services, information sharing and credit facilities but may not have knowledge on the best way to reach the clients as far as access to inputs, information and extension services input supply functions of the maize value chain.

Farmers access their inputs from agricultural inputs outlets and other government outlets like the National Cereals and Produce Board stores. These in turn access the inputs from manufacturers and distributors. The findings of this study will hopefully assist them identify potential and beneficial forward and backward linkages with the maize value chain actors.

1.7 Basic Assumption of the Study

The basic assumptions are that one, that the objectives of NAAIAP have been achieved to a large extent. It was assumed that all the targeted farmers have a positive attitude about this project. Another basic assumption is that the farmers who benefited were the ones who were initially targeted. It was assumed that the inputs provided were the most appropriate for the area under study and those records are available about the program. Finally it was assumed that respondents were able to recall what they had not recorded in writing.

1.8 Limitations

Accuracy of the questionnaire was addressed by pilot testing it before rolling out the study and making changes as necessary. Data collection was limited by a number of factors with time being the most important. After identifying the names of the respondents, it became difficulty to locate their homes and book appointments for interviews. To overcome this challenge, the researcher used village elders who were identified by the Assistant Chief of Itabua sub location to assist him reach the respondents. In three cases, the respondents who were targeted were not available during the study period and could not be available within the next two months since two of them were far while one was admitted in hospital. This limitation was overcome by replacing the unavailable respondents with the nearest farmer who participated in the same program but had not been selected during sampling.

It was planned that data collection would take less than 5 days. However, it took longer because some respondents were elderly and illiterate and could not understand the questions put to them from the questionnaires. They also could not recall some of the experiences of 2006 and 2007. To overcome this limitation, the researcher engaged 2 data collection assistants to help in the exercise. The researcher also used the village elders and other literate family members to put across the issues and solicit answers. The other limitation was change of names of administrative units since the project was initiated in 2007. The current name is Embu West district which was curved from the former and larger Embu district. The targeted area remained Itabua sub location that is currently in Mbeti North Location.

1.9 Delimitations of this Study

This study was confined to farmers who participated in NAAIAP in 6 villages of Itabua sub location in 2007. It's located in Mbeti North location of Embu West district that lies 10 kilometers to the east of Embu town. Itabua sub location covers an area of 43km^2 with a population of 15,091 people. With a household size of 5, there are 3,018 households each owning between 1.25acres and 5acres of land. The area receives a bimodal rainfall pattern of between 800 and 1,400 mm annually. The April –May season is the main season while the October –December season characterized by short rains. The main crops are maize, beans, macadamia, bananas and mangoes. In each season about 3325acres of maize is planted yielding 1.2 bags per acre in a poor season and 5.6 bags per acre when the season is successful. The main challenges facing maize farming are poverty and changing weather conditions leading to low crop yields. 35% of the households live below the poverty line which makes access to agricultural inputs challenging. Access to extension services is poor

with agricultural extension staff: farmer ratio of 1:1,347. This means if one staff was to visit 3 farmers daily, he or she would need 400 days to visit each farmer just once. There is only one agricultural inputs outlet in Itabua sub location and farmers have to travel to Embu town that is about 10 kilometers to access inputs, markets and information. NAAIAP benefited over 300 farmers in Itabua sub location in 2007 with many more benefiting in the subsequent years in the sub location and other locations.

1.10 Definition of Significant Terms

The following are key terms used in this study.

Access to inputs refers to how easily farmers are able to acquire seeds, fertilizers, finances, extension messages and information at the appropriate and required periods and in the right amounts.

National Accelerated Agricultural Inputs Access Project (NAAIAP) , refers to the Ministry of Agriculture programme in Embu West among other districts that aims at improving maize production through improving access to maize inputs, information and extension services on maize production.

Maize production here refers to the practice of preparing for planting, weeding, harvesting and post harvest handling of maize for subsistence of commercial purposes.

Access to information, refers to the ability of farmers to acquire information on fertilizer, seeds, finances, credit and markets for the products

Access to extension services refers to having access extension services that provide information on appropriate seeds, spacing of crops, agronomic practices through approaches like farm visits, field days, demonstrations and training courses.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature and studies relating to access to inputs, information and extension services and how the access impacts in maize production.

2.2 Access to agricultural inputs and how it impacts on maize production

Maize is the dominant staple food in Eastern and Southern Africa, accounting for 40% of the calories consumed mainly by the poor, most of whom are women and children (Mugo, Songa, DeGroote, & Hoisington, 2002). In Malawi, FISP was successfully implemented to pre-empt famine despite the opposition of some of Malawi's donors. At a cost of $60m (£30m), roughly $5 per Malawian, the government provided seed and fertilizer at reduced cost to more than 1m small-scale maize farmers. This represented a huge financial burden for Malawi's government. The results have been spectacular. Malawi's smallholder farmers are harvesting a bumper crop for the second year running, which may reach a record 3.2 million MT. Yields have soared, helped by favorable rains. Malawi plans to export grain to hungry neighbors (Jeffrey, 2007).

State-led fertilizer subsidies can contribute to sustained poverty reduction. This was evident in the input and output marketing policies that featured prominently in the "green revolution" successes achieved in Asia in 1970 and 1980s can be replicated successfully in Africa (Doward, Kydd, Morrisson, & Urey, 2004). However, fertilizer subsidies have sustainability effects in different scenarios. Where the private sector is relatively active and

average wealth is higher (areas seemingly more likely to be targeted by government programs), results indicate that subsidies have substantially crowded out the private sector, in some cases to the point that such programs could actually lower overall fertilizer use. On the other hand, in poorer areas where the private sector is relatively inactive, subsidies help to generate demand and crowd in private sector retailers (Zhiying, Burke, Jayne, & Jones, 2009).

Subsidies in inputs are not popular with some development agencies. The conditions under which fertilizers subsidies can contribute to sustained poverty reduction are very demanding and in practice not easy to achieve (Morris, Kelly, Kopicki, & Byerlee, 2007). Input access programs can improve a country's economic growth or become a disincentive of the private sector participation in service delivery.

Many agricultural experts see the use of modern inputs, in particular fertilizer, as the key to agricultural productivity (Dufflo, Kremer, & Robinson, 2009). Pointing to the strong relationship between fertilizer use and yields in test plots, they argue that fertilizer generates high returns and that dramatic growth in agricultural yields in Asia and the stagnation of yields in Africa can largely be explained by increased fertilizer use in Asia and continued low use in Africa (Morris et al, 2007). Based on this logic, (Ellis, 1992) and (Sachs, 2004) argue for fertilizer subsidies. Many governments have heavily subsidized fertilizer. In India, for example, fertilizer subsidies amounted to 0.75 percent of Gross Domestic Product (GDP) in 1999–2000 (Gulati & Sudha, 2003). In Zambia, fertilizer subsidies consume almost 2 percent of the government's budget (World Bank, 2007).

African leaders, International Policy makers and agricultural experts highlighted that significant challenges face African farmers as a result of declining soil fertility and productivity (Ayinde, Adewumi, & Omotosho, 2009). African Union and its African member states signaled the intention to scale-up the use of fertilizer subsidies as a means to address rural poverty (Zhiying, Burke, Jayne, & Jones, 2009).

Maize is the most important grain crop in Kenya and is produced throughout the country under diverse environmental conditions. The Insect-Resistant Maize for Africa (IRMA) baseline survey carried out in year 2002 confirms that more than 40 distinct maize varieties are currently grown across maize-growing ecologies in Kenya. However, despite the existence of all these maize varieties, access to appropriate seed is still a problem. Given the limited land area and low irrigation development capacity, there is no doubt that Kenya will have to rely more on modern technologies for increased yields. Use of improved maize varieties and fertilizers will therefore continue to be critical inputs for improving productivity and enhancing gains in maize yields (Ouma, DeGroote, & Owuor, 2006). Maize production in Kenya relies on the small-scale farmers who contribute about 75% of the overall production, with the remaining 25% being contributed by the large-scale farmers. (www.epzakenya.com.). However, production levels are always lower than demand leading importation of grains to bridge the deficit (Muchena, Mbuvi, & Wokabi, 1988). This justifies the need to study the impacts of the NAAIAP on small holder farm productivity.

Per capita maize consumption in the Eastern and Southern region of Africa averages more than a 100 kilogram (kg) per year [103 kg per year in Kenya, and as high as 182 kg per year in Malawi] (Pingali, 2001). The per capita maize consumption in Malawi is higher due to

probably the impacts of the FISP. Kenya is also implementing NAAIAP program and there is need to establish if such per capita maize consumption can be achieved.

Households using purchased hybrid seeds together with fertilizer realized the highest productivities of 8.6, 12.3 and 10.3 90-kg bags per acre in 1997, 2000 and 2004 respectively (Zhiying, Burke, Jayne, & Jones, 2009). Those households that did not use hybrid seeds and inorganic fertilizers realized low maize productivities: 2.1, 3.3 and 2.7 ninety kg bags per acre in the same periods under consideration (Mulu & Jayne, 2006).

Access to finances from the formal, informal and non formal sources also impacts on maize production. The non formal and informal sources of finance include friends, families, money lenders, stockists, and marketing agents while the formal sources include microfinance institutions, savings and credit societies and established financial institutions. Lack of credit translates into inadequate working capital, and therefore, farmers are unable to purchase productivity-enhancing inputs such as seeds, fertilizers, pesticides and land preparation. The estimated marginal effect shows that, ceteris paribus, the use of hybrid maize seed increases technical efficiency by 36 percent (6.14 bags) (Kibaara, 2005). With increased use of fertilizer and improved seed and other practices by 1000 farmers in Sauri, Kenya, maize harvest more than tripled (Pedro, 2004). Kenya heavily relies on maize as the staple food for green, milled or dry grain form (GOK, 2011). According to the Economic Review of Agriculture (ERA), in the year 2010 nationally, maize production increased by 46% from 27 million bags in 2009 to 38.5 million bags in 2010 (GOK , 2011) . This was attributed to a number of factors; favorable weather conditions, increase in area under maize by 8.5%, and improved access to fertilizer especially at the beginning of the 2010 and up scaled

distribution of certified maize seed through inputs support programs implemented by MOA. Productivity is reported to have increased due to improved access to fertilizer, maize seed, and mechanization services and improved delivery of extension services to farmers. The other factor could be government investment in irrigation projects under the Economic Stimulus Program food production component along the Tana Delta.

2.3 Access to Information and how it impacts on maize production

In order to plan, farmers need various kinds of information. Access to information on quality of agricultural inputs, credit, financial sources and markets for products plays an important role in the use of the inputs. The information required can be sourced from fellow farmers when they exchange experiences, during meetings through observations, during visits, from media, agro dealers and from own experiences.

Few studies have been carried out on how access to information impacts on maize production. As Markets information is important in improving maize productivity and farmers will get more profit and plant more maize if they have access to information on markets and market prices (Nabbomba & Bahiigwa, 2003). The two also further observed that household head level of education is important and the higher the number of years spent in school, the higher the profits realized from maize. They concluded that this is perhaps related to the ability of the farmer to appreciate and take up improved technology and also concluded that farmer's education is important and therefore education intervention should be fully operationalised. They specifically observe that adult education components benefit farmers with low level of education and that it could be useful to introduce agriculture as a

subject in schools in future. They recommend the strengthening of agricultural extension systems in order to improve information access and improve production.

2.4 Access to extension services and how it impacts on maize production

Extension as a service has diverse definitions but can be summarized as a field where agricultural professionals play a role in identifying, adapting and sharing technology that is appropriate to the needs of individual farmers within diverse agro-ecological and socioeconomic contexts (Landon & Powell, 1996). The term 'extension' is here understood to mean 'advisory and other services' that help rural families to make the best possible use of the productive resources at their disposal (Katz, 2002). Extension services are an important institutional input for agricultural development.

Extension messages range from types of inputs, agronomy, post harvest handling, utilization, value addition, savings mobilization and marketing linkages. Various approaches are used. These include farm visits, field days, specialized training sessions, farmer field schools, visits to agricultural or research stations, demonstrations and agricultural shows. According to a worldwide survey conducted by the FAO in 1988–9, about 81% of extension work around the world is carried out through a ministry or department of agriculture (Umali and Schwartz, 1994). In ideal situations the extension services serve as a feedback avenue from farmers to research. In designing an extension system, contact with farmers, their active participation and the determination of farmers' need for technology are critical (Basnyat, 1995).

Achieving gains in agricultural production efficiency will depend on many factors but extension is likely to be among the most important (Tchale & Sauer, 2007). In Nepal extension education improves productivity through increased efficiency, reduced wastage and better management of crops (Ratna, 2007). Extension advice in sampled districts of Uganda also contribute to improved maize productivity perhaps through advice on what maize variety to plant, when to plant or other agronomic information such as spacing that are important in realizing higher yields (Nabbomba & Bahiigwa, 2003). A general consensus exists that extension services, if properly designed and implemented, improve agricultural productivity (Romani 2003); (Bindlish & Evenson, 1993) ; (Evenson, 1998); (Birkhaeuser, Evenson, & Feder, 1991). Agricultural extension services provide farmers with important information, such as patterns in crop prices, new seed varieties, crop management, and marketing. In a study carried out in Nepal by the Center for Rural Development and Self-help (CRDS) Ratna, (2007) observed that the growing gap between food demand and supply is mainly attributed to the very low productivity of the agricultural sector. Many factors were identified to contribute towards the development of agriculture, including extension as an institutional input.

In Kenya, the importance of agricultural extension in relation to the fight against poverty has been underscored in the Strategy to Revitalize Agriculture (SRA) (GOK, 2004). The declining effectiveness of the public extension service has been identified as one among the factors impeding agricultural growth in Kenya. Extension services not only advice to increase farm productivity, but also advice on a diverse range of rural development options including markets, value addition, and diversified income opportunities.

Households closer to extension service providers used high yielding technologies and realized higher yield than households far away from such services. While other factors most likely contribute to these relationships, the proximity to extension services does appear to be correlated with small farmer's uptake of productivity enhancing technology (Mulu & Jayne, 2006).

The National Agriculture and Livestock Extension Program (NALEP) formulated by MOA in 1999 has the purpose of promoting demand driven extension services by advancing technologies that increase production and linking production to marketing (GOK, 2009). This has been providing extension messages though CIG's, field days and farmer field schools. The program has been recommended for their efficiency in delivering extension messages, promoting experience sharing among farmers and providing feedback for research. This is as opposed to and farm visits that require a significant number of extension staff to visit individual farmers. The extension staff may not be available due to reduced governments spending on recruitment of extension staff (GOK, 2009).

2.5 Theoretical Framework –Systems Theory

The theoretical framework adopted by this study is the Systems theory. The basic idea of systems theory in social science is to solve classical problems of duality. It applies to research efforts focused on problems that cross the boundaries of two or more disciplines, such as research on effective information systems for improved maize production. Systems theory has its foundations in the field of systems dynamics, founded in 1956 by Professor Jay Forrester. Professor Jay recognized the need for a better way of testing new ideas about social systems by allowing people to make their understanding of social systems explicit.

System theory approach differs from traditional analysis approach in that it focuses on how things being studied interact with the other constituents of the system. Instead of analyzing (by breaking systems into smaller parts) systems theory expands its view and takes a holistic approach to take into account the larger picture of interactions as an issue is being studied.

In this study, systems theory has been used to understand the complex interactions between the components of NAAIAP and the maize farming system in Itabua sub location. The maize production dependent variable has been studied as a network of unique interacting interrelationships that have identifiable structural and communication systems.

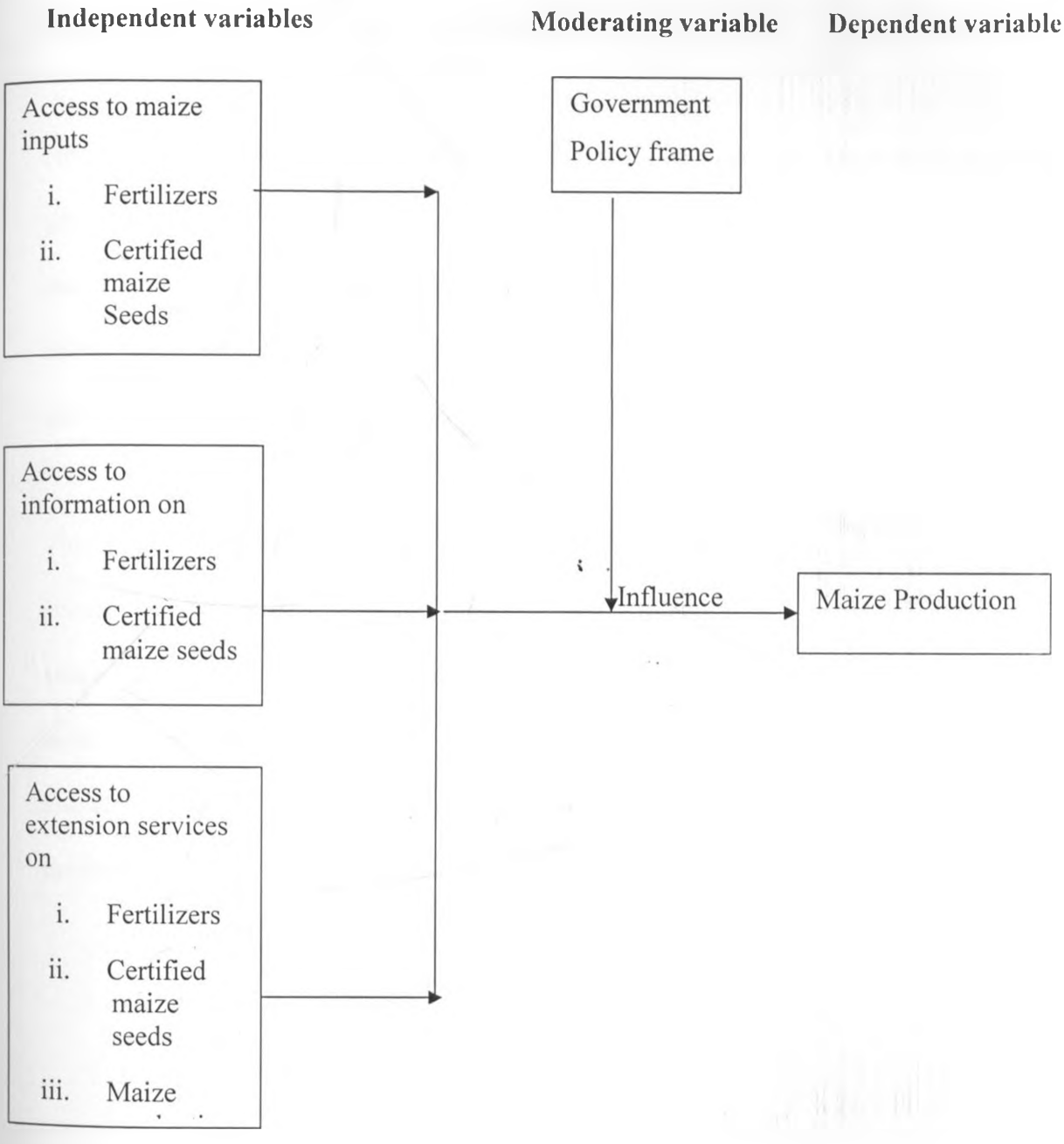
2.6 Conceptual Frame Work

A conceptual framework is a graphical representation of the effect of the independent variables on the dependent variable (Mugenda & Mugenda, 2003). This study has concentrated on the one dependent variable that is maize production and three independent variables.

One of the independent variable is access to inputs that include seeds, fertilizers and finances. The second one is access to information on quality of inputs, markets, credit and finances. The third independent variable is access to extension services through farm visits, field days, group training and exposure visits. These are the sources of extension messages like crop agronomy, pest control, post harvest handling, value addition and utilization.

The mediating variable is the existing government policy framework. This includes subsidy policies, food security policies, maize pricing policies and importation of maize policies. This mediating variable however is not discussed in this study.

Figure 2.1; The Conceptual Frame work



2.7 Knowledge Gaps

Literature on impacts of access to inputs programs have been reviewed from other countries. Literature on impacts of assesses to agricultural inputs, information and extension services on maize production in Kenya have also been reviewed. Studies on impacts of agricultural

inputs subsidy programs like NAAIAP have not been undertaken despite the possible positive or negative impacts they may have.

No studies have been carried out on NAAIAP since it was initiated. There exists knowledge gap on the extent of impact of access to inputs as a component of NAAIAP programme on maize production. There also exist knowledge gaps on the extent of impacts of access to information on inputs quality and finances on maize production. There also exist knowledge gaps on the impacts of access to extension services on maize production.

This study therefore explores the extent of impact of NAAIAP program components of access to inputs, access to information and extension services on maize production. This study has focused on Itabua sub location of Embu West district where the programme has been implemented in the last four years. This study has limited itself to bridging the existing knowledge gap on the impacts of the three components of NAAIAP programme on maize production.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology used in this study. Research methodology gives direction to follow to get answers to issues that are of concern (Leedy, 1993). The components of research methodology discussed here include the research design, the targeted population, the sampling design and procedure. It also includes the data collection methods, data collection procedure, and data analysis techniques.

3.2 Research Design

This research is based on qualitative descriptive research design. This involved a process of collecting data in order to answer questions concerning the current status of the subjects in the study (Mugenda & Mugenda, 2003). Descriptive research design allows researchers to determine status quo as well as gather facts rather than manipulate the variables.

Qualitative research design has been selected because as Patton (1990) as cited by Gakuu & Kidombo (2010) says, it uses different data than those used in traditional research methods. This survey research focuses on people, their beliefs, opinions attitudes, motivation, and behavior (Kerlinger, 2002).

The researcher used this approach because one of the main areas of interest was in reviewing written documents from other countries. The researcher was also interested in collecting and analyzing data, establishing the facts as they are with regard to impacts of accelerated access to agricultural inputs on maize production in Kenya and other countries. The researcher was

also interested in the opinions of the respondents as far as such future interventions are concern.

3.3 Target Population

The target population of this study was made up of 300 small holder farmers who participated in NAAIAP programme in 2007 in Itabua sub location of Central division of Embu West district.

3.4 Sampling Size and Sampling Procedure

This section discusses the sampling size and the sampling procedure.

3.4.1 Sampling size

Sampling is taking any portion of a population or universe as a representative of that population or universe. Further, a sample drawn at random is unbiased in the sense that no member of the population has any more chance of being selected than any other member (Kerlinger, 2002). 10% of the population or 30 respondents of the accessible population is adequate for this descriptive study Gay(1981). Using Gay's suggestion, the sample size that was used in this study is 30 respondents drawn from a population of 300 farmers.

3.4 .2 Sampling Procedure

The sampling procedure was systematic sampling technique. This techniques is easy to operate, checking can be done quickly, and is more efficient than random sampling (Gakuu & Kidombo, 2010). A list of the 300 farmers who participated in NAAIAP in 2007 in all villages of Itabua sub location was collected from the Divisional Agricultural Extension

Officer's (DAEO) office in Central division. The names of the farmers were then randomly arranged. The researcher then picked the first name by randomly pointing at this name using a pointer. The 25th farmer was then picked as the first respondent. Counting from this name, every other 10th name was ticked and marked with a highlighting pen. 30 respondents representing 10% of the population were marked and picked. The Assistant Chief Itabua sub location then called all village elders who went through the list and identified the marked names from the areas they represent. The interview program was then agreed on and the researcher and assistants agreed on the days to visit each village. Whenever the targeted respondent was not available for the interview, the nearest farmer who participated in NAAIAP in 2007 was to be picked and interviewed.

3.5 Data Collection Instruments

Data collection was through a questionnaire survey, through face to face interviews with respondents. A questionnaire consisting of structured and semi-structured questions had been prepared, pretested and was used in the survey. Primary data collected from the sampled respondents by use of a four page 1.5 line spaced questionnaire. The questionnaire was made up of 4 sections. Each section had a number of closed or open ended questions depending on the number of indicators that were being sought. The close ended questions provided data that was easily analyzed to describe qualitative information. The open ended questions were used to generate grouped data to further explore about the indicators in question.

Section A sought data about the respondents profile; gender, age, education level, household characteristics and inputs received from NAAIAP. Four close ended questions and three open ended questions were posed to respondents.

Section B sought data for assessing the extent of impact of access to inputs (seed, fertilizer) on maize production. Five questions of which three were close ended while one was open ended were posed to respondents.

Section C sought data for examining the level to which access to information on the program impacted on maize production. Four close ended questions were posed to the respondents.

Section D sought data for examining the level to which access to extension services impacted on maize production. It constituted seven close ended questions.

3.5.1 Pilot Testing of the Instrument

Pilot testing was carried out on the questionnaire to assess its appropriateness by reading and presenting it to three respondents not involved in the main study. This assisted identify and rectify weakness in the questionnaire before actual research was conducted. A few items of the questionnaire were changed after pilot testing.

3.5.2 Validity of the Instrument

Validity in this study refers to the appropriateness, meaningfulness, and usefulness of the inferences a researcher makes (Gakuu & Kidombo, 2010). Validity is about drawing warranted conclusions on a situation based on data obtained from an assessment. An instrument is valid if the research design fully addresses the research questions and

objectives the researcher has set. The validity of the questionnaire was assured through involvement of my supervisors. Their inputs through discussions assisted in developing the objectives, research questions, indicators and items to be put across to the respondents. This also assisted in putting face and content validity in the instrument. Peer review and pilot testing became useful in improving the validity of the questionnaire.

3.5.3 Reliability of the Instrument

Reliability is a measure of the degree to which a research instrument yields consistence results or data after repeated trials, (Mugenda & Mugenda, 2003). Reliability depends on random errors that may also arise from the way the questionnaire is prepared, coded, administered and analyzed. During pilot testing, items that had a problem or gave unexpected answers were modified to avoid misinterpretation. Reliability was further tested using the internal consistency technique. Twelve items form the questionnaires were correlated among themselves and Cronsbach's Coefficient Alpha was computed from the SPSS program for 12 items selected from the questionnaire. The Cronsbach Alpha (α) value generated for 12 items of the questionnaire was 0.768 which shows a good level of internal consistency for the 12 items.

3.6 Data Collection Procedure

Data was collected from secondary and primary sources. The procedure used was first collecting secondary data from Literature, journals and reports from the DAEO and District Agricultural Officer (DAO) offices. Primary data was collected from respondents in the field using questionnaires as described in section 3.5. Observations in the field were used in the

field to supplement some of the items in the questionnaire. The procedure used was first operationalizing the variables. This was through preparing the research questions from the objectives, identifying the appropriate indicators, types and levels of measurement for the indicators. This was followed by the development of the questionnaire that had four sections. The questionnaires were discussed with the supervisors, pilot tested for appropriateness, tested for validity and reliability. The items and likely scores in the final questionnaire were coded and entered into the Statistical Package for Social Scientists (SPSS) program. The questionnaires were thereafter administered to 30 respondents in a four day interview program organized between the researcher, his assistants and the village elders. They were administered by reading them and filling in responses in the questionnaire provided. The filled in questionnaires were later collected for in putting and analysis.

3.7 Data Analysis Techniques

After the data was collected it was computed ready for analysis. The main processing methods were editing, decoding, tabulation, classification and analysis. Descriptive statistics like percentages, frequencies and mean were generated. The results of the analysis or findings are presented inform of tables and used for making conclusions and recommendations

3.8 Operationalization of Variables

Operationalizing the variables involved identifying the variables, determining the indicators, assigning types and levels of measurements to the indicators, and lastly identifying the tools

and types of analysis. Table 3.1 below shows how the research concepts and variables were operationalized to make them measurable.

Table 3. 1; Operationalization of variables

Research question	Type of variable	Indicators	Measurement	Level of scale	Tools for analysis	Type of analysis
To what extent has access to inputs impacted on maize production?	**Independent** (access to fertilizers and maize seeds)	Access and use of seeds, fertilize and finances	Rate of use of inputs Quantity of seeds, quantity of fertilizer yields per acre and maize availability used	Nominal ,ordinal, interval and ratio	Frequencies and percentages	Descriptive
To what extent has access to information impacted on maize production?	**Independent** (access to information on maize)	Information Networks , types of information markets, and information networks on where to source quality inputs, and finances	Names and number of useful information networks Names and Number of useful Sources of information Measure of Meaningfulness and appropriateness of information gotten	Ordinal, interval and ratio	Frequencies and percentages	Descriptive
To what extent has access to extension impacted on maize production?	**Independent** (access to extension messages- Farm visits Field days Training sessions)	Type and number of extension services –field days, farm visits, training sessions Kind of advice from extension officers on seasons, maize production techniques , post harvest and utilization	Frequency of visits by officers Number of field days attended Number of other training sessions Feeling of usefulness of extension messages to maize farming Feelings on timeliness of messages , Rate of adoption of extension messages	Ordinal, interval and ratio	Frequencies and percentages	Descriptive
To what level has Maize production changed due to the three components of NAAIAP	**Dependent** Maize production	Yields, maize availability at household ,Income from sale of surplus maize produce	Kilograms per area or per amount of seeds, number of months when food is available income in shillings on sale of surplus maize	Ordinal, interval and ratio	Frequencies and percentages	Descriptive

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS INTERPRETATION AND DISCUSSIONS

4.1 Introduction

The purpose of this study was to investigate the extent of impact of the three components of NAAIAP on maize farming in Itabua Sub-location of Embu West district. From a population of 300 farmers who participated in NAAIAP project in 2007, a sample of 30 respondents was interviewed using questionnaires. After data collection, the findings were generated .This chapter presents, interpret and analyses the findings and discusses the findings of this study.

4.2 Questionnaire Return Rate

30 (100%) of the questionnaires were returned. This was possible because the researcher and his assistants administered the questionnaires themselves unlike in other instances where the questionnaires are either mailed or left to be filled by the respondents after which they are either mailed back or collected by the research team.

4.3 General Information on Respondents

This study required that data and general information about the respondent's be collected so as to understand their background. The general information was important in relating findings and literature review. The general information included gender, age, educational level, household size, land dedicated to maize and amount of grant inform of certified maize seeds and fertilizer received from NAAIAP.

4.3.1 Gender Distribution

It was important to get a background of the respondent's gender so as to compare it with MOA reports reviewed. According to the Ministry of Agriculture Strategic Plan for 2005-2010 (GOK, 2009) gender equity is one of its core value that has led the ministry into developing a Gender Mainstreaming Strategy. It was also important to relate gender with other variables and how the grant impacted on maize production. The respondent's gender was recorded and presented.

Table 4. 1: Gender Distribution

Gender	Frequency	Percent
Male	8	26.7
Female	22	73.3
Total	**30**	**100.0**

Of the 30 respondents interviewed, 22 (73%) were female while 8 (27%) were male. This is because according to the Gender Mainstreaming Strategy, the ministry recognizes the important role played by women in production and the fact that they are poorer than their male counterparts. According to the same Gender Mainstreaming Strategy, the ministry is committed to giving efficient service delivery to its male and female clients of diverse social cultural and social economic status or gender groups. Findings from this study indicate that more women were targeted .This shows the project interventions are within the MOA Gender Mainstreaming Strategy.

4.3.2 Age Distribution of the Respondents

It was also necessary to have a background on the age distribution among the respondents. The respondents were asked to indicate the age group they fit in.

Table 4. 2: Age distribution of the respondents

Age bracket	Frequency	Percent
23-27	1	3.3
28-32	3	10.0
33-37	1	3.3
38-42	25	83.3
Total	**30**	**100.0**

The findings indicate that 25 (83%) of the respondents were aged over 37 years. Less than 5 (17%) of those interviewed were youth or below the age of 35 years. The mean age of respondents was 38.5 years. This means the youth and men who form some of the gender groups targeted in agriculture interventions did not benefit as much as women and the middle aged. Equally, the elderly were not targeted maybe because they are dependents and they may be unavailable for group meetings which are also attended by their children as farmers.

4.3.3 Distribution of Educational Level

The educational level of the respondents was also important so that the study could establish if it's related to use of technology in maize production and resultant yields. The respondents were asked to indicate up to what level of formal education they attended.

Table 4. 3: distribution of educational levels among the respondents

Educational Level	Frequency	Percent
None	4	13.3
Primary	19	63.3
Secondary	6	20.0
Tertiary	1	3.3
Total	**30**	**100.0**

The findings are that the majority of respondents 26 (86.7%) had attained at least primary level of education with 19(63.3%) having attained primary level as the highest level. Only 13% had not had any formal education in their lives. This shows that 86.7% of the targeted beneficiaries could at least communicate in one national language, read and write which could affect their use of extension messages, information about seeds and fertilizer technologies.

4.3.4 Distribution of Household Sizes

House hold sizes are important because the number of months the maize harvested will last depends on the house hold size. The respondents were asked to indicate how many people are fed from the family kitchen. This included the children, dependants, workers and other relatives.

Table 4. 4: Distribution of household sizes among respondents

Number of house hold members	Frequency	Percent
1-5	13	43.3
6-10	15	50
Over 10	1	3.3
Total	**29**	**100.0**

Findings are that 15 (50%) out of the 29 respondents who responded to this question have households with between 6 and 10 members while 13(43.3%) of households have between 1 and 5 members .One respondent did not wish to give information on the number of household members in her home. (N=29). The mean house hold size is 7.8 members. Reports reviewed from the DAEO's office indicated that the average household size is 5 members which is much lower that this study's findings. The difference maybe because the DAEO reports only takes into account the children and parents leaving out the other dependants who have been considered in this study. Findings from this study are that an average 1.25 acres is dedicated to maize producing 7.3 bags of maize annually .How long the harvest will take depends on the house hold size. Larger household sizes require 8 bags of maize annually while annual production is 7.3 bags. This means the aim of the program on saving and selling maize grains and using the proceeds for inputs purchase next season could not be possible.

4.3.5 Size of land dedicated to maize each October season.

It was important to understand the size of land that families allocate to maize so as to make it possible to estimate the productivity or yields of maize per acre. Respondents were asked to state how much land they dedicated to maize each October season.

Table 4. 5: Size of land dedicated to maize in April 2011

Size of land under maize	Frequency	Percent
Up to 1 acre	15	50
Between 1.1 and 2 acres	9	30
Over 2 acres -3 acres	6	20
Total	**30**	**100**

Findings are that 15 (50%) of the respondents dedicated up to 1 acre of their land to maize production in any October season. 9 (30%) dedicate between 1 and 2 acres to maize while only 20% planted between 2 and 3 acres of land with maize in the same season. The mean land size dedicated to maize production is 1.25 acres. Reports reviewed from the DAEO office indicated that average amount of land dedicated to maize in Central division is 1.1 acres. This compares well with the findings of this study. The study's findings are higher probably because Itabua sub location is in the lower drier area of Embu district with lower population density compared to the wetter and higher tea and coffee zones that have higher population density. According to the ERA (GOK, 2011), the average maize production for Eastern Province stands at 3.2 bags per acre. Further, the monthly Food Situation reports for 2009 reviewed from the DAEO Central division indicates that average maize production figures for Mbeti North location in a good season stand at 5.6 bags per acre. In a poor season they stand at 1.2 bags per acre. Data collected by this study shows that in 2006 before NAAIAP was initiated in Itabua, average maize yields were 2.6 bags per acre. This is comparable despite the fact that most farmers said that the weather conditions are worsening. After using free inputs, this increased to 3.3 bags per acre which is still in the range indicated by the DAEO's and ERA's reports.

4.3.6 Type and amount of grant received from NAAIAP in 2007

It was important to get information on what the farmers actually received and compare this with what the plans were. Respondents were asked to state how many kilograms of certified maize seeds, they received and planted.

Table 4.6: Amount of certified maize seeds received from NAAIAP in 2007

Amount of seeds	Frequency	Percent
1-5kgs	4	13.3
6-10kgs	26	86.7
Total	**30**	**100.0**

When asked what amounts of maize seed they received as grant from NAAIAP, 4 (13.3%) of respondent indicated that they received between 1 and 5 kilograms while 26 (87%) indicated they received between 6 and 10 kilograms of seed. The mean amount of certified maize seeds received by the respondents in 2007 was 7.3 kilograms. Plans were to provide each farmer with 10 kilograms of certified seeds hence there was a shortfall of on average 2.7 kilograms of certified seeds. Discussions held with the agriculture staff indicated that the shortfall in supply was because the suppliers contracted supplied fewer amounts of seeds. This was because the price of maize seeds increased between the periods the supply contracts were agreed on and the dates the seeds were supplied occasioning them to supply less to cover the increased cost. It was also important to get the amount of fertilizer supplied compared with the planned supplies. This was so as to relate it to performance in the farms. The respondents were asked to state the amount of fertilizer they were supplied with for planting and top dressing.

Table 4. 7: Amount of fertilizer received from NAAIAP in 2007

Fertilizer type	Amount (kilograms)	Frequency	Percent	Average amount (kilograms)
DAP(planting)	50	30	100.0	50 .0
CAN(top dressing)	50	29	96.6	48.3

Where as planting fertilizer was distributed to 30 (100%) of the respondents, the case for top dressing fertilizer was different. 29 (96.6%) of the respondents reported receiving 50

kilograms of fertilizer each. One respondent who was a lady did not receive top dressing fertilizer. The mean amount of DAP fertilizer received per farmer was 50 kilograms while the mean amount of CAN fertilizer received was 48.3 kilograms because of the one respondent who did not receive any CAN. Records from farmers are therefore tallying with the official records on fertilizer distribution.

4.3.7 Type and sources of maize seeds planted in April 2011

It was important to get information on the extent of use of certified seeds by respondents during the April 2011 season. This was so as to find out what other different sources of seeds exist apart from NAAIAP. The respondents were asked how much seed they used in April 2011.

Table 4.8: Sources of certified maize seeds in April 2011season

Type and source of seeds	Frequency	Percent
Certified seed flesh from shops	13	43.3
Own farm saved seed	11	36.7
Both certified and own farm seeds	5	16.7
Certified seeds remaining from last season	1	3.3
Total	**30**	**100.0**

14 (46.63%) of the respondents indicated they planted certified seeds either fleshly bought from input shops or remnants from the last season. 11 (36.67%) said they recycled own seeds or bought from neighbors while 5 (16.7%) used both own seeds and certified seeds. It follows that a considerable number of respondents 13(45%) still use recycled seeds despite the fact that recycling hybrid seeds leads to reduced yields. KARI Embu has come up with a maize variety (EMCO) that may do well in this area and is suitable for recycling. This issue may require further investigations whether farmers can use this seed to mitigate the

increasing costs of hybrid seeds. The Insect-Resistant Maize for Africa (IRMA) baseline survey carried out in year 2002 confirms that more than 40 distinct maize varieties are currently grown across maize-growing ecologies in Kenya. However, despite the existence of all these maize varieties, access to appropriate seed is still a problem. Findings from this study have revealed that about 45% of the respondents use recycled maize seeds due to lack of access to certified hybrid maize seeds. Since there are maize varieties like EMCO from KARI Embu that maybe suitable for this area and can be recycled, their adoption should be explored.

4.4 Access to inputs and maize production

The first objective of this study was to assess the extent to which access to inputs as a component of NAAIAP impacted on maize production in Itabua sub location.

This required the gathering and comparing data on the yields in 2006 and 2007, and assessing the extent of yields by different categories of farmers. Respondents were asked to recall how much they harvested in October 2006 season and the season after they were provided with NAAIAP inputs in 2007. The yields were then computed against 1.25 acres which was the mean acreage that was computed arrived at for the respondents.

Table 4.9: Comparison of responses on maize yields 2006 and 2007

Level of harvest /acre	**Year**			
	2006		2007	
	Frequency	Percent	Frequency	Percent
Less than 1 bag	4	13.3%	6	20%
Between 1 bag and 5 bags	22	73.3%	14	46.7%
Between 6 and 10 bags	4	13.3%	10	33.3%
Total	**30**	**100%**	**30**	**100%**

The general observation was that the number of respondents who indicated harvesting more than 5 bags more than doubled from 4 (13.3%) in 2006 to 10 (33.3%) in 2007. The category of respondents who indicated harvesting between 1 and 5 bags decreased from 22 (73.3%) in 2006 to 14 (46.7%) in 2007. The possible explanation is that 6 (20%) of these respondents had an increase in yields in 2007 to over 5 bags while 2(6.7%) indicated a decrease in yields to below 1 bag per acre in 2007 compared to 2006.

There was therefore need to know why after being supplied with inputs they still had reduced yields. They were hence asked to state one reason why there was a reduction in yields.

Table 4.10: Reasons for reduced yields

Reason for reduced yields	Frequency	Percent
Inadequate rainfall	12	40.0
Late supply of inputs	6	20.0
No comment	12	40.0
Total	**30**	**100.0**

12(40%) of the respondents said it was due to inadequate rains while 6(20%) said the reason was because the inputs were supplied late. A good number 12(40%) had no comment and probably they may never have used the inputs. The inputs were in some villages supplied after the rains had started a fact that was acknowledged by the farmers and village elders, this could have led to crop failure. The MOA planning process took long and this led to delay in planting. Since the rainfall amounts in a season are decreasing due to global warming, this may have compounded the problem and may be led to reduction in yields due to late planting.

4.4.1 Access to certified maize seeds and maize production

Access to certified maize seed is a critical factor in maize production. It was important to assess whether and to what extent access to certified maize seeds impacted on maize production since it was one input that were accessed through NAAIAP. The respondents were asked if they had problems accessing seeds in 2006

Table 4.11: Response on problems occurred while accessing certified seed in 2006.

Response	Frequency	Percent
Yes	24	80.0
No	6	20.0
Total	**30**	**100.0**

24(80%) of the respondents indicated they had problems accessing certified maize seeds in 2006 while 6(20%) indicated they had no problem. Further analysis was carried out on this group that previously had problems accessing certified maize seed. The responses from this group were cross tabulated against their corresponding yields in 2006 and 2007 and compared.

Table 4.12: Comparison impact of certified seed on yields

Year	% respondents with these yield brackets						Total	
	Less than I bag		1-5 bags		6-10 bags			
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2006	4	16.7	17	70.8	3	12.5	24	100.0
2007	3	12.5	13	54.2	8	33.3	24	100.0

From this group, the number of respondents that harvested less than 1 bag in 2006 declined from 4 (16.7%) in 2006 to 3(12.5%) in 2007. The number of respondents who previously harvested between 1 and 5 bags declined from 17(70.8%) in 2006 to 8(54.2%) in 2007. However, the number who harvested between 6 and 10 bags almost tripled from 3 (12.5%) in 2006 to 8 (33.3%) in 2007. This shows that access to certified maize seeds through NAAIAP may have led to increase in the number who had between 6 and 10 bags because the ones who had less than 5 bags decreased from 21 (87.5%)in 2006 to 16 (66.7%) in 2007. The computed mean harvest for the 24 respondents who had problems accessing seeds in 2006 was 2.6 bags while in 2007, the same number had a mean harvest of 3.5 bags per acre, an increase of 35%. Mulu & Jayne (2006) state that in a study carried out in 26 districts in Kenya in 2006, use of hybrid seeds and fertilizer led to tripling of maize productivity in 1997, 2000 and 2004. This compares well with findings of this study that has revealed that maize yield doubled or almost tripled in 2007 due to NAAIAP inputs compared to 2006.

4.4.2 Access to planting fertilizers and maize production

Fertilizers for planting affect yields of maize. It was therefore necessary to collect information and assess whether and to what extent access to planting fertilizer impacted on maize production. All the 30 respondents were asked if they had problems accessing planting fertilizer before NAAIAP was initiated.

Table 4.13: Response on problems occurred while accessing fertilizer in 2006.

Responses	Frequency	Percent
Yes	22	73.3
No	8	26.7
Total	**30**	**100.0**

22 (73.3%) of those interviewed said they had problems in accessing planting fertilizer in 2006. From this group (N=22), their corresponding yields in 2006 and 2007 were cross tabulated.

Table 4.14: Comparison of impacts of planting fertilizer on maize yields

Year	% respondents within these yield brackets						Total	
	Less than I bag		1-5 bags		6-10 bags			
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2006	4	18.2	15	68.2	3	13.6	22	100.0
2007	3	13.6	13	59.1	6	27.3	22	100.0

The number in this category that had maize yields increase to over 5 bags per acre doubled from 3(13.6%) in 2006 to 6 (27.3%) 2007. The number of respondents who harvested more than 5 bags increased because 3 of those who harvested less than 5 bags in 2006 got better yields in 2007. Further, those who harvested less than I bag in 2006 reduced from 4 (18.2%) to 3 (13.6%) in 2007. The number of those who harvested between 1 and 5 bags reduced from15 (68.2%) in 2006 to 13(59.1%) and got more than 5 bags in 2007. The mean yields for this group in 2006 was 2.6 bags per acre which increased by 23% to 3.2 bags per acre. This increase could have been due to the improved access to planting fertilizer by those who previously harvested less than 5 bags. Ouma, DeGroote & Owuor, (2006) urge that improved maize varieties and fertilizers will continue to be critical inputs for improving productivity and enhancing gains in maize yields. Findings from this study indicate that access to improved inputs increases yields by an average of 23 % from about 2.6 bags to 3.3 bags per acre for farmers who have about an acre of land under maize.

4.4.3 Access to top dressing fertilizer and maize production

Top dressing fertilizer plays an important role in maize production and it was necessary to assess whether it impacted on maize production and to what extent. Respondents were asked if they had problems accessing top dressing fertilizer before they participated in NAAIAP.

Table 4.15: Response on problems of accessing top dressing fertilizer in 2006

Responses	Frequency	Percent
No response	1	3.3
Yes	25	83.3
No	4	13.3
Total	**30**	**100.0**

One respondent did not indicate her position as far as access to top dressing fertilizer is concern. Findings indicate that 25 (83.3%) of the respondents had problems accessing top dressing fertilizer in 2006. The corresponding yields for this group (N=25) in 2006 and 2007 were compared and an interesting scenario emerged.

Table 4.16: Comparison of impacts of top dressing fertilizer on yields

Year	% respondents within these yield brackets						Total	
	Less than I bag		1-5 bags		6-10 bags			
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2006	4	16	18	72	3	12	25	100
2007	4	16	14	56	7	28	25	100

The number of those who harvested more than 5 bags more than doubled from 3(12%) in 2006 to 7(28%) in 2007. This could be because the number of those who harvested between 1 and 5 bags in 2006 declined from 18(72%) to 14 (56%) because they now harvested more than 5 bags in 2007. There was no important on access to CAN for those who harvested less than 1 bag in 2006 compared to 2007. Maybe they never used the topdressing fertilizer even

after being recorded and acknowledging having received the same. The respondents reported yields increase from 2.6 bags per acre to 3.2 bags per acre, an increase of 23% with the same reason as was for planting fertilizers. According to the ERA (GOK, 2011) in the year 2010, national maize production increased by 46% in 2010 due to improved access to fertilizer, maize seed, mechanization services and improved delivery of extension services to farmers. The findings of this study point out at the possibility of access to maize seeds and fertilizers as probably resulting in an increase of productivity among small farmers by 23%. This improvement in productivity due to access to inputs is by almost 50% of what the Economic Stimulus Program and access to mechanization combined have contributed to the 46% national increase in more production. Access to inputs therefore may be more important in improving national food production than all other factors put together. Just as literature reviewed had indicated, access to inputs impacts positively on maize production as from this study has brought out. The impacts of the three sub components of access to inputs; access to certified maize seed, access to planting fertilizer and access to top dressing fertilizer were summarized and their extents of impacts compared. Access to certified seed resulted in 35% increase in mean yields as compared to fertilizers that resulted in 23% increase in mean yields probably because farmers use organic manures as an alternative to inorganic fertilizers.

4.5 Access to information and maize production

The researcher's second objective was to examine whether respondents had access to information through NAAIAP and to what extent the information impacted on maize production. This meant finding out how information on fertilizers, seeds and markets was

could have impacted on maize production. It was therefore important to collect data on subthemes that are associated with access to information and analyze the relationship with maize production.

4.5.1 Sources of the program information

It was critical to understand which were the sources for information about the program . This was so as to examine how maize production was relating for those respondents who accessed the program information. The respondents were asked to state how they accessed four particular information types about the program in 2007.

Table 4.17: Sources of information during NAAIAP

Type of information	Sources of information							
	Inputs shops		Groups meetings		Radio and newspapers		Totals	
	F	%	F	%	F	%	F	%
Sources of inputs	4	13.3	23	76.7	3	10.0	30	100.0
Quality of inputs used	4	13.3	21	70.0	5	16.7	30	100.0
Sources of finances	2	6.7	25	83.3	3	10.0	30	100.0
Sources of markets for maize	2	6.7	25	83.3	3	10.0	30	100.0
Averages	**4**	**13.3**	**23.5**	**78.3**	**3.5**	**11.7**	**30**	**100.0**

On average 23.9(78.3%) of respondents interviewed indicated they accessed information from group meetings cutting across all the different kinds of information. Only 4 (13.3%) accessed information from inputs shops while 3.5 (11.7%) of the respondents accessed information from the media. Reports reviewed from the National Agriculture and Livestock Extension Program (GOK, 2005), the focus on extension programs is now in CIG's due to reduced staff strength. This ties very well with the approach that NAAIAP has used to reach more farmers using fewer extension resources.

4.5.2 Access to information and maize production

During the process of implementing NAAIAP, farmers were to initiate CIGs that were to be used for mobilizing resources, accessing information through networks, accessing extension services and marketing the maize through the Receipt Warehouse System. Data was collected based on four subthemes based on kinds of information; information on sources of maize seeds and fertilizers, information on quality of maize seeds and fertilizer, information on sources of finances and lastly information on sources of markets for maize produce

4.5.2.1 Information on sources of inputs and maize production

One of the key sub substance of access to information was information on sources of inputs namely fertilizers and maize seeds. It was important to understand if access to this information had any impact on maize production and to what extent. This meant taking the responses of 23 (78.3%) respondents who accessed information from group meetings to the next level of analysis. The responses from this group were cross tabulated with their corresponding yields in 2006 and 2007.

Table 4. 18: information on source of inputs against maize production

Yield levels in bags / acre	Scores of responses in 2006 compared to 2007				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bags	4	17.4	4	17.4	0
1-5 bags	16	69.6	10	43.4	-26.2
6-10 bags	3	13.0	9	39.2	+26.2
Total	**23**	**100.0**	**23**	**100.0**	

The analysis indicated that the number of those who harvested less than 1 bag of maize in 2006 compared to 2007 did not changed while the number of those who harvested between 1 and 5 bags reduced from 16(66.7%) in 2006 to 10(43.4%) in 2007. The number of respondents who recorded over 5 bags of maize per acre increased by from 3(13%) in 2006 to 9(39.2%0 in 2007. When the means for their yields were computed, it was found that the average yields improved from 2.9 bags in 2006 to 3.6 bags per acre in 2007, an increase of 24% probably because of access to information on sources of inputs. This compares well with what scholars have reported that access to information leads to increased production in the short and long run. This is because networks are created which are useful in the short and long term periods.

4.5.2.2 Information on quality of inputs and maize production

Information on quality of inputs was also important as a subcomponent of access to information and it was important to examine if it impacted on maize production and to what extent. The responses from 23 (78.3%) who accessed this information from group meetings were further cross tabulated with corresponding yields in 2006 and 2007.

Table 4. 19: information on quality of inputs against maize production

Yield levels in bags / acre	**Scores of responses in 2006 compared to 2007**				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bag	4	17.4	6	26.0	+8.6
1-5 bags	17	73.9	10	43.5	-30.4
6-10 bags	2	8.7	7	30.5	+21.8
Total	**23**	**100.0**	**23**	**100.0**	

The trend in changes in relation to information on quality of inputs and corresponding yields were similar to the ones on information on sources of inputs. When the average changes in yields were computed for all the categories the average was zero. The mean changes in yields were also minimal from 2.8 bags to 3.1 bags per acre when comparing 2006 and 2007. This was a mere 8% probably due to access to information on quality of inputs. One important thing is that personal experience on quality of inputs is one of the key ways farmers associate quality of inputs with sources of the inputs be they agro dealers or government.

4.5.2.3 Information on sources of finance and maize production

It was important to examine if access to information on finance was as a sub component on access to information impacted on maize production and to what extent. The corresponding yields in 2006 and 2007 for the 23 (73.3%) respondent who accessed information from groups was cross tabulated with the responses on information on sources of finance.

Table 4.20: information on finance and maize production

Yield levels in bags / acre	Scores of responses in 2006 compared to 2007				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bags	3	13.0	5	21.7	+8.7
1-5 bags	18	78.3	9	39.15	-39.2
6-10 bags	2	8.7	9	30.15	+21.5
Total	**23**	**100.0**	**23**	**100.0**	

The trend was similar to the one on the source of information on sources of inputs and quality of inputs. The average between the categories whose responses showed change in yields were computed and found to be -3%. This could probably mean that access to

information on finance did not impact on yields. When the mean change in yields were computed , they were however found to be from 2.5 bags in 2006 to 3.5 bags per acre probably due to access to due to other factors. Discussions with some of the respondents revealed that the extension staffs have started linking the respondent with financiers while some agro dealers have linked the farmers with the AGMARK-Kenya output marketing program which is also one of the recommendations of this study.

4.5.2.4 Information on markets for maize produce

It was important to examine if information on sources of markets for maize produce impacted on maize production and to what extent. Yields in 2006 and 2007 for 23 (73.9%) of respondents who indicated they accessed information from group meetings were cross tabulated.

Table 4. 21: Comparison of yields with access to information on markets for maize

Yield levels in bags / acre	**Scores of responses in 2006 compared to 2007**				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
2>Bags	3	13.0	4	17.4	+4.4
1-5 bags	18	78.3	11	47.8	-30.5
6-10 bags	2	8.7	8	34.8	+26.1
Total	**23**	**100.0**	**23**	**100.0**	

The trend for this group was the same as the other three presented above. The average changes in yields across categories were zero. However the mean yields computed showed that yields increased from 2.4 bags to 3.4 bags per acre, an increase of 10% probably due to

other factors other than access to information on sources of markets. Information reviewed on a study carried out in 26 counties in Uganda by Nabbomba & Bahiigwa, (2003) reveals that markets information is important in improving maize productivity and farmers will get more profit and plant more maize if they have access to information on markets and market prices. This has been confirmed to some extent by this study since access to information on markets probably led to an increase in production by 10% for the 23 respondents who had access to information in maize markets.

4.5.2.5 Educational level and maize availability after harvest

It was necessary to analyze the relationship between maize after harvesting and educational level. Immediately maize is harvested, families will thresh and store the grains for use as food. The respondents were asked to indicate how many more months maize was available in 2007 compared to 2006.

Table 4.22: Responses on how much longer maize lasted compared to 2006

Extra number of months maize was available in 2007 compared to 2006	Frequency	Percent
One month	1	3.3
Two months	2	6.7
Three months	3	10.0
Four months	6	20.0
Over four months	7	23.3
Those who had no surplus	11	36.7
Total	**30**	**100.0**

A total of 19 (63.3 %) of the respondents indicated that they had surplus maize after 2007 October season while 11 (36.7%) indicated they did not have surplus available after harvest.

The respondents who indicated they had surplus maize said the available maize could last longer by between 1 and over four extra months in 2007 compared to 2006. The researcher was also interested in establishing if educational level of the respondents had any relationship with availability of maize after harvesting. The educational levels of the respondents were cross tabulated with the extra number of months they had maize available in 2007 compared to 2006.

Table 4.23: Comparison of education level and maize availability

Educational level	**Responses**	**Extra months maize was available in 2007 compared to 2006**					**Total**
		One month	Two months	Three months	Four months	Over four months	
None	Count	0	2	0	0	2	4
	%	0	50.0	0	0	50.0	100.0
Primary	Count	0	0	3	5	4	12
	%	0	.0	25	41.7	33.3	100.0
Secondary	Count	1	0	0	1	1	3
	%	33.3	0	0	33.3	33.4	100.0
Tertiary	Count	0	0	0	0	0	0
	%	0	0	0	0	0	100.0
Total	**Count**	**1**	**2**	**3**	**6**	**7**	**19**
	%	**5.3**	**10.5**	**15.8**	**31.6**	**26.8**	**100.0**

The results indicate that 2 (50%) of those with no formal education had food available for three or more months compared with; 12 (100%) who had primary level of education or 2(66.7%) of those who had secondary level of education. It seems those who had tertiary level of education may not have been interested in keeping maize maybe because they can buy maize using other sources of income. Nabbomba & Bahiigwa, (2003) observed that household head level of education is important and the higher the number of years spent in

school, the higher the profits realized from maize. This, they say is perhaps related to the ability of the farmer to appreciate and take up improved technology. However this study has reveled that, probably due to the fact that those with higher levels of education are not worried with storing maize harvested probably because they have other farm income to buy the maize. The study as revealed that, probably due to lower levels of education the less educated store maize longer for their families than those with higher levels of education.

4.6 Access to extension messages and maize production

The third objective of this study was to examine the level to which access to extension services as a component of NAAIAP impacted on maize production. It was also important to access the extent to which this access to extension services or messages impacted on maize production. This necessitated examining the types of messages, mode of delivery, perceived benefits and relationship the messages had with maize production for those who accessed extension services. The key extension messages were on maize spacing and planting dates; maize varieties suitable for farms, kinds and uses of fertilizer in maize, savings mobilization and market linkages.

4.6.1 Extension services received

The first task was to establish whether extension services were received by the respondents. This was so as to further analyze data and cross tabulate to establish to what extent the extension services impacted on maize production. Respondents were asked whether they received extension services when they started participating in NAAIAP.

Table 4.24: responses on whether extension services were received

Receipt of extension services	Frequency	Percent
Yes	29	96.7
No	1	3.3
Total	**30**	**100.0**

Indications were that 29(96.7%) of the respondents received extension messages through extension services. The respondents were further asked what the source of extension messages was or how the extension services reached them.

Table 4.25: Source of extension messages

Sources of extension messages	Frequency	Percent
Field days	5	16.7
Trainings at groups meetings	18	60.0
Exposure visits	1	3.3
Field days /extension officer visiting the farm	2	6.7
Field days and trainings	3	10.0
Extension officer visiting the farm & training	1	3.3
Total	**30**	**100.0**

18 (60%) indicated they received the services through trainings in group meetings while 5 (16.7%) received the messages through field days. The others 7(23.3%) received messages through a combination of field days, exposure visits and farm visits. They were also requested to indicate the frequency of the extension messages.

Table 4. 26: Frequency of extension messages

Frequency of receiving extension messages	Frequency	Percent
Once	2	6.7
Twice	4	13.3
More than twice	24	80.0
Total	**30**	**100.0**

24 (80%) indicated they received the messages more than twice while 6 (20%) indicated they received the messages once or twice. The respondents were also asked if the messages were timely and 23 (76.6%) of the respondents indicated that the extension messages were timely while 7(23.4%) said the messages were late. However, 29 (96.67%) said the messages were appropriate and an equal number 29 (96.7%) felt that the extension messages impacted positively on maize production in general.

4.6.2 Extension messages received and their benefits

The researcher also wanted to get a feeling of how the respondents ranked the extension messages. This was important so that the impacts of the extension messages could be related to other aspects of the programme. Respondents were asked to indicate the level of benefits they felt extension messages had on maize production.

Table 4:27 Levels of benefits from extension messages

Kind of message	Level of benefit of the message							
	Quite Beneficial		Moderately beneficial		Not beneficial		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Maize spacing & date of planting	20	66.7	8	26.7	2	6.6	30	100.0
Maize variety suitable to your farm	19	63.3	6	20.0	5	16.7	30	100.0
Kinds & uses of fertilizers in maize	19	63.3	9	30.0	2	6.7	30	100.0
Savings mobilization	16	53.3	7	23.3	7	23.3	30	100.0
Market linkages	10	33.3	7	23.3	13	43.4	30	100.0
Average	**16.8**	**56**	**7.4**	**24.7**	**5.8**	**19.3**	**30**	**100.0**

The levels were beneficial, moderately beneficial or not beneficial. 16.8(56%) indicated all messages were quite beneficial while 7.4 (24.7%) indicated the messages on average were moderately beneficial. Only 5.8(19.3%) indicated the messages were not beneficial. When ranked individually, the message on maize spacing, varieties suitable to farms and kinds and uses of fertilizers were ranked as the quite beneficial by 18.5(62%) of the respondents. Nabbomba & Bahiigwa (2003) say that extension advice in sampled districts of Uganda also contributed to improved maize productivity perhaps through advice on what maize variety to plant, when to plant or other agronomic information such as spacing that are important in realizing higher yields. This relates well to the findings of this study that actually extension services when provided to support access to inputs contributes to improved maize production.

4.6.3 Extension messages on inputs and maize production

Extension services deliver messages for use by farmers in production. This study was interested in investigating whether extension services impacted on maize production and to what extent. Different subcomponents of the extension services and messages were therefore investigated. This study has picked and investigated only 3 (60.0%) of the 5 groups of extension messages since the three relate closely to maize inputs directly and were ranked as very beneficial by 20(66.7%) of the respondents. These are the extent of impact of messages relating to maize spacing and planting dates, maize varieties suitable for farms and kinds and uses of fertilizer in maize.

4.6.3.1 Message on maize spacing and date of planting and maize production

It was important to find out if all the respondents received extension messages on maize spacing and planting dates. This was so as to further analyze the extent of the impact of the message on maize production. The respondents were asked if they received extension messages on maize spacing and planting dates.

Table 4.28: Response on receipt of extension message

Did you receive extension messages on maize planting and spacing	Frequency	Percent
Yes	28	93.3
No	2	6.7
Total	**30**	**100.0**

28(93.3%) reported having received the messages on maize spacing and planting dates while 2 (6.7%) had not. The maize yields in 2006 and 2007 for this category that had 28 respondents was analyzed further .The responses on extension message on maize spacing and planting dates was cross tabulated with the scores in maize yields in 2006 and 2007.

Table 4.29: Cross tabulation maize yield and extension message.

Yield levels in bags / acre	Scores of responses in 2006 compared to 2007				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bags	4	14.3	6	21.4	+50.0
1-5 bags	21	75.0	13	46.4	-38.1
6-10 bags	3	10.7	9	32.2	+200.9
Total	**28**	**100.0**	**28**	**100.0**	**Average +70.9**

The number of respondents who had over 6 bags tripled from 3 (10.7%) in 2006 to 9(32.2%) in 2007. It's probable that access to extension message on maize planting led to improved maize production for 70.0 % of all respondents across all categories. A general consensus exists that extension services, if properly designed and implemented, improve agricultural productivity (Romani, et al 2003). Findings from this study show that access to extension services probably led to increased maize production in Itabua sub-locations and agree with Romani et al (2003) findings.

4.6.3.2 Message on kind and use of fertilizer and maize production

The respondents were asked if they received extension messages on kinds and uses of fertilizer. 30 (100.0%) reported having received this message. The maize yields in 2006 and 2007 for this category that had 30 respondents was analyzed further .The responses on message on kinds and uses of fertilizer was cross tabulated with the scores in maize yields in 2006 compared to 2007.

Table 4.30: Cross tabulation maize yield and extension messages

Yield levels in bags / acre	**Scores of responses in 2006 compared to 2007**				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bags	4	13.3	6	20.0	+50.4
1-5 bags	22	73.4	14	46.7	-36.4
6-10 bags	4	13.3	10	33.3	+150.4
Total	**30**	**100.0**	**30**	**100.0**	**Average +54.5**

The number of respondents who had over 5 bags more than doubled from 4 (13.3%) in 2006 to 10 (33.3%) in 2007. The number of respondents who harvested less than a bag in 2006 increased by 50% from 4(13.3%) in 2006 to 6(20.0%) in 2007. This was because 2(6.7%) of those who harvested between 1 and 5 bags in 2006 had declined in yields in 2007 to less than a bag. It's probable that access to this source of information led to improved maize production for categories who harvested more than 5 bags in 2006 compared to 2007.

4.6.3.3 Messages on suitable maize variety and maize production

It was found desirable during the study to find out if access to information on maize variety suitable for particular farms impacted on maize production and to what extent. The respondents were asked to indicate if they received this message from extension services.

Table 4.31: Responses on receipt of extension messages

Did you receive message on suitable maize variety for your farm	Frequency	Percent
Yes	28	93.3
No	2	6.7
Total	**30**	**100.0**

28(93.3%) indicated they received the message with only 2(6.7%) indicating they did not receive it. The maize yields in 2006 and 2007 for this category that had 28 respondents was analyzed further .The responses on message on kinds and uses of fertilizer was cross tabulated with the scores in maize yields.

Table 4.32: Cross tabulation of maize yields and extension messages

Yield levels in bags per acre	Scores of responses in 2006 compared to 2007				
	2006		2007		
	Count	Percent	Count	Percent	Percent change
1>Bags	4	14.3	6	21.4	+49.6
1-5 bags	20	71.4	12	42.9	-39.9
6-10 bags	4	14.3	10	35.7	+150
Total	**28**	**100.0**	**28**	**100.0**	**Average +53.2**

The number of respondents who harvested more than 5 bags of maize more than doubled from 4 (14.3%) in 2006 to 10 (35.7%) in 2007. Also the number who harvested less than 1 bag increased from 4(14.3%) in 2006 to 6 (21.4%) in 2007. These two findings can be explained by the fact that six of those who harvested between 1 and 5 bags in 2006 harvested more than 5 bags in 2007.

The theoretical frame work for this study is the Systems theory that solves problems of duality. The access to inputs, information and extension services on maize production can also be viewed from this approach. Systems theory allows people to make their understanding of social systems explicit. This approach focuses on how the components of NAAIAP that are being assessed interact with the other constituents of the maize production system. It is holistic and takes into account the larger picture of interactions as an issue is being studied. On this premise, respondents were asked a number of questions. This was on what had been their view on impacts of NAAIAP on access to inputs, credit and finance. Respondents were to rank the impact of NAAIAP on access to maize seeds.

Table 4.33: Ranking of levels of impacts

Level of impact	Frequency	Percent
Negative impact	2	6.7
No impact	3	10.0
Moderate positive impact	8	26.7
A lot of positive impact	17	56.7
Total	**30**	**100.0**

25 (83.3%) said it had positive impacts while 5 (16.7%) said either it had no impact or had negative impacts on fertilizer access. Probably where NAAIAP had no impact was because of the high cost of seeds from the commercial sources. The same respondents were asked what the impact of NAAIAP was on access to fertilizer for planting.

Table 4.34: Ranking of levels of impacts

Level of impact	**Frequency**	**Percent**
Negative impact	1	3.3
No impact	4	13.3
Moderate positive impact	10	33.3
Alot of positive impact	15	50.0
Total	**30**	**100.0**

25(83.3%) indicated the project had impacts while 5 (16.7%) indicated it had no or negative impacts. When asked what was impact on access to top dressing fertilizer, the results were the almost the same. Further the respondents were asked to state the level of impact of the project on access to credit and finance. The findings are different.

Table 4.35: Ranking of levels of impacts

Level of impact	Frequency	Percent
Negative impact	1	3.3
No impact	16	53.3
Moderate positive impact	8	26.7
Alot of positive impact	5	16.7
Total	**30**	**100.0**

The findings were that 17 (56.6%) indicated there was no impact on access to credit and finance for purchase of maize inputs. 15 (43.4%) said there was moderate a lot of impact. Findings from this study show that access to extension services led to the fact that 100.0% of respondents reported increased maize availability for one or more months in 2007 compared to 2006. Further, reports reviewed from the DAEO's records indicated that the existing staff; farmer ratio of 1; 1,347 could be unfeasible. This is if the existing staff paid farm visits instead of group visit approach. The group approach employed by NAAIAP was however beneficial with indications being that 18.6 (62.0%)of respondents who got extension messages and information through groups saying the messages were beneficial. 23 (76.6%) said they were timely, while 29 (96.7%) saying they were appropriate and impacted positively on maize production in general.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study whose purpose was to investigate the impact of NAAIAP on maize farming in Itabua sub location of Embu West district. The chapter presents a summary of the findings, conclusions derived from findings and recommendations on how the program can be improved. Areas needing further research and the contribution of this study to the body of knowledge are also captured in this chapter.

5.2 Summary of Findings

The findings of this study are summarized on the basis of the three study objectives. These three study objectives were based on the three project components. The first objective of the study was to assess the extent to which access to certified maize seeds and fertilizer as inputs impacted on maize production. The second objective of this study was to examine the level to which access to information on the programme impacted on maize production. This information was on quality of inputs, source of inputs and markets. The third objective was to examine the level to which access to extension services impacted on maize production. The extension services provided extension messages on maize agronomy and post harvest handling.

5.2.1 Access to inputs and maize production

Findings from data collected indicate that the three components of NAAIAP impacted positively on maize production. The impact was to the extent of yield per acre and availability of maize for families. Maize yields increased from 2.65 bags in 2006 to 3.28 bags per acre in 2007, an increase of 23.8%. Access to maize seeds resulted in increased yields for all categories of farmers. The percentage of farmers who harvested between less than 5 bags in 2006 reduced in 2007. Equally, the percentage of farmers who reported increase in maize yields to more than 5 bags almost tripled from 12.5% in 2006 to 33.3 % in 2007.

Access to fertilizers had impacted on maize production to the extent of maize yields. The number of those who reported less than 5 bags of maize harvest in 2006 reduced in 2007 while those who reported having achieved more than 5 bags doubled from 13.6% to 27.3% in 2007 due to access to planting fertilizer. Access to topdressing fertilizer did not make any difference in 2006 compared to 2007 for those who harvested less than 1 bag in 2006. However the percentage of those who harvested between 1 and 5 bags in 2006 reduced compared to 2007. This is because the percent of those who harvested more than 5 bags more than doubled from 12% in 2006 to 28% in 2007.

The impact of access to inputs was also related to maize availability by households of different sizes. Findings are that in 2007 the extent of the impact was that maize was available for between 1 and 4 months more months compared to 2006 for all categories of households. This increase in maize availability was for 58% of a family size of between 6

and 10 members, 36.9% of small families with between 1 and 5 members and 5.2% of large households with over 10 family members.

5.2.2 Access to information and maize production

Findings are that the percentage of farmers reporting receiving information on maize seeds, fertilizers and markets for produce from group meetings increased due to NAAIAP from 53.3% to 66.7%. The increase was by 13.4%. Access to information on source of maize seeds and fertilizer can be said to have resulted to the extent that maize as a food was available for between 1 and 4 more months and above for 40% (N=12)of the respondents in 2007 compared to 2006.

Access to information on quality of maize seeds and fertilizers was indicated to have led to availability of maize as food for between 2 and over 4 more months for 36.7% (N=11)of respondents in 2007 compared to 2006. It's also probable that 53.3% (N=16) of respondents had increase in food availability for 1 or over 4 more months in 2007 compared to 2006 due to access to information on sources of finance. Lastly its also probable that 50% (N=15) of farmers who reported increase in food availability for 2 and up to over 4 more months in 2007 compared to 2006 did so due to access to information on markets for maize produce.

5.2.3 Access to extension services and maize production.

Extension messages were received through group trainings (60% of respondents) and field days (16.7% of respondents). This was through regular trainings by the extension staff on maize spacing and planting, suitable maize varieties, kinds of fertilizers, savings mobilization, market linkages and cropping patterns. 80% of respondents indicated they

received the messages more than twice with 76.6% saying the messages were timely while 96.7% said the messages were appropriate. Over 50% of the respondents said the messages on maize spacing and planting, maize varieties, kinds and uses of fertilizers and savings mobilization were beneficial. 40% of the responses were that the message on markets was not beneficial partly because they rarely harvest surplus maize for sale.

Extension messages impacted positively on maize production and to the extent of food availability at family level. Among those who said they have received extension messages since NAAIAP started, 100% indicated they as a result have maize as food that can last for more than 1 more month in 2007 (N=18) compared to 2006 . Further 66% indicated that they have maize as food to last them 4 or more months in 2007 compared to 2006 while 33% indicated they have maize to last them between 1 and 3 more months in 2007 compared

5.3 Conclusions.

A number of conclusions can be drawn from this study. The three components of NAAAIP that are access to inputs, information and extension messages impacted positively to different extents on maize production in Itabua sub location. This was however only in the short term or immediately after the harvest in 2007. First, access to certified maize seeds and fertilizer impacted on maize production to the extent that average yields improved from 2.6 bags per acre in 2006 to 3.3 bags per acre in 2007. This was a 23% improvement on maize yields. The extent of the impact was limited to the short term immediately after the season. Secondly the program also impacted on maize production to the extent of the immediate availability of maize as food at household level.

The project components led to improved maize availability by between 1 and over 4 extra months in 2007 compared to 2006 for 100% all households. The extent was that 58% of house holds that had between 6 and 10 members per household had maize available for between 1 and 4 extra months in 2007 compared to 2006. 40% of households with between 1 and 5 family members had maize as food being available between 1 and over 4 extra months in 2007 compared to 2006.

Access to information led to increased knowledge on where farmers could source quality inputs, sources of finance and market information. This in turn impacted on the farmer's decision making process that led to improved maize production and maize and food availability immediately after the harvest season. The improved information access complemented availability of inputs and led to improved maize production and food availability in 2007 compared to 2007. The access to information on finances and markets impacted on maize production in the short run and may continue impacting on maize production in future since networks have already been created or strengthened whose benefits will be realized later.

Access to extension services through groups improved access to modern maize production technologies and techniques for over 60% of the farmers to the extent that they had improved maize yields in 2007 compared to 2006. The other impact was on food availability where maize availability improved for the house holds. Most farmers acknowledged that the extension messages on use of inputs were very beneficial in maize production both in the short and long term extents. Extension messages on savings mobilization and market linkages were not found to be very beneficial in the short run

probably because they could not harvest enough for household use and still have surplus for sale. All in all, access to extension services impacted on maize production in the short run and may continue impacting on maize yields and availability of maize as a food in the long run. Greater impacts on maize production and maize availability could have been realized in the short run if the farmers harvested more maize. The reasons they could not produce surplus to sell was probably due to high food demand from large house hold sizes, limited land available for maize cultivation and inadequate amounts of rain. Probably the Hybrid 513 maize variety the farmers were provided with and due to late delivery of the inputs meant their production potential was not fully exploited.

NAAIAP did not impact the long term needs of Itabua sub location as far as access to inputs is concern. Even after participating in NAAIAP in 2007, 50% of the respondents indicated they still have problems accessing maize seeds. The cost of maize seeds continues to rise every year and 45% of respondents are resorting to use of own saved seed as revealed by this study. 23% still have problems accessing finances for maize production. A further 16.7% still has problems accessing both finance and inputs years after participating in NAAIAP.

5.4 Recommendations

This study has led to a number of recommendations on what government, farmers and researchers should do to improve access to inputs and its impacts to maize production

5.4.1 Recommendations on future grants programs

Where grant programs are to be replicated in future the study recommends the following.

1. The criteria used to select farmers who will participate in future NAAIAP grants programs be revised so that farmers selected can provide sizes of land that can produce adequate maize for their families and avail surplus for sale. The farms should be large relative to household sizes

2. Inputs should be availed early enough just before farmers start preparing their land which usually is a month before the onset of the rains.

3. The type and variety of maize seeds to be supplied should relate to farmers experiences on the area. This is because they understand the varieties that do well under their economic, management and climatic environments better since they have lived there for long and have first hand experience with the local conditions. The possibility of involving KARI Embu station as a supplier of EMCO maize seed should be explored since the seed can be recycled.

5.4.2 Recommended Exit strategies for existing grants programs

Where the program has already been carried out an exit plan should be clearly defined right from the onset. This is so as to let the groups carry over access to inputs and grain markets activities as a group.

1. The groups are linked with financial and micro financial institutions early enough for credit arrangement. There are such programs like Equity Bank Kilimo Biashara Package that are available and have been tried in the district.

2. Social economic opportunities associated with groups should continue being explored and exploited like trainings and experience sharing, purchase of seeds on group basis and sale of produce through groups

3. The groups are linked to input suppliers for bulk supply of inputs like NCPB among others for economies of scale. This means the government continues providing subsidized inputs so that they are accessible through such outlets.

4. The groups are linked with insurance companies and input suppliers that are providing farm inputs insurance schemes like Sygenta. Sygenta is providing inputs insurance through their Kilimo Salama scheme where farmers pay a premium for the inputs they buy and are compensated in case of crop failure.

5. The groups are linked with grains consumers like millers to purchase their grains in bulk. They may also be linked to agricultural inputs dealers who are participating in the World Food Program Output Marketing schemes as is the case of Mwingi district through AGMARK.

All in all the government should continue supporting farmers with subsidized inputs through and make sure inputs are available on time in future. The government should also evaluate the programs performance in other parts of the country with a view of enriching its future endeavors in sustainable access to inputs programs.

5.4.3 Areas for Further Research

The researcher suggests that further research on the following should also be carried out.

1. Strengths, Weaknesses, Threats and Opportunities of seed recycling in maize production.
2. How maize production and food availability relate to each other at household level for small holder farmers
3. What other challenges limit sustainable maize production and how can they be addressed

5.5 Contribution to body of knowledge

This study has contributed to the body of knowledge in a number of ways. This is summarized in table 5.1 below.

Table 5.1: Contribution to body of knowledge

Objective	Contribution
Extent of impact of access to inputs on maize production	Access to inputs impacts on maize production to the extent of increased yields and food availability. However , access to seeds is more important than access to fertilizer in maize production
Extent of impact of information on maize production	Impacts of access to information are more long term than short term
Extent of impact of extension services on maize production	Access to extension services impacts positively on maize production. Individual farm visits are not effective extension services in public extension systems

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APPENDICIES

APPENDIX 1: LETTER OF INTRODUCTION

TO WHOM IT MAY CONCERN
Embu DISTRICT

Dear Sir/Madam

RE: Letter of Introduction.

I am a student at the University of Nairobi, Department of Extra Mural Studies currently pursuing a Masters Of Arts Degree in Project Planning and Management.

My research is focusing on National Accelerated Agricultural Inputs Access Program in Itabua sub location where I am assessing its impacts on maize production. I am requesting for your assistance to get data on the project and promise that the information provided will be treated with confidence and will be only used for the purposes of this study.

Please assist and thank you in advance.

Yours faithfully

Anthony Njogu Njurai

APPENDIX 2: QUESTIONAIRE FOR FARMERS IN ITABUA LOCATION

This questionnaire was used for collecting information and data from farmers on the assessment of the impacts of the NAAIAP programme components on maize production in Itabua location. The components are covered in three sections and cover access to inputs, access to information and access to extension services. The questionnaire also assisted collect background information on the respondents and what the respondents feel should be done to improve access to inputs and maize production.

Section (A)–Respondent Background

1. Gender of respondent–male (.....) female (...)
2. Age bracket 18-22 (....) 23-27 (....) 28-32 (...) 33-37(....) 38-42(....)
3. Educational level? None (...) primary (...) secondary (....) tertiary (....)
4. Number of household members .....
5. Size of farm where you grow maize in April 2011; Up to 1 acre (...) between 1.1 and 2 acres (....) over 2 -3 acres (...)
6. Type and amount of Grant that was received from NAAIAP

Type of input	Amount in kilograms
Certified maize seed	
Fertilizer for planting maize	
Fertilizer for top dressing maize	

7. Where did you source maize seeds and how much did you plant in 2011 April season. Fill in table below.

Type of seed	Source
Certified maize seed bought this season	
Certified maize seeds from last season	
Own farm seed	

Section (B) Impact of access to inputs on maize production

1. Before 2007, did you have problems accessing maize farming inputs? Please fill in the table below

Input type	Yes	No
Certified maize seeds		
Planting fertilizers (DAP, NPK) for maize		
Top dressing fertilizer(CAN) for maize		

2. How much maize did you harvest in 2006? Less than 1 bag (…) between 1 and 5 bags (…) 6-10 bags (….)

3. In the year you were supplied with fertilizer and seeds for maize by NAAIAP how much maize did you harvest? Less than 1 bag (…) between 1 and 5 bags (…) 6-10 bags (….)

4. If production of maize was lower when given NAAIAP inputs compared to 2006 what was the main reason?

   ……

5. What amounts of fertilizer and seeds did you use in April 2011 on maize and how much did it cost you? (Fill in table below)

Input	Amount kilograms	Cost in Kenya shillings
Certified maize seed		
Certified Seeds that remained from last season		
Own farm seed		
Planting fertilizer for maize		
Top dressing fertilizer for maize		

Section (C) Impact of access to information on maize production

1. In 2007, where did you get the most beneficial information on the following items (Tick only one source per information type)

Information type	Category of source		
	Inputs shop	Groups meetings	Radio and newspapers
Information on sources of maize seeds and fertilizer used in maize production			
Information on quality of maize seeds and fertilizer used in maize			
Information on sources of finances for maize production inputs			
Information on sources of markets for maize produce			

2. How many more months was maize as food available in 2007 compared to 2006? One month …two months….., three months ….four months …. Over four months……

3. Is the group you are a member of now having a maize marketing activity? Yes (...) No (...)

4. If answer to 2 above is NO, what is the reason? There is no maize to sell (…) there are no groups to join (…) any other reason……

Section (D) impacts of extension services on maize production

1. Since you were given the free maize inputs, (2007) have you received extension messages in maize production? Yes (…) no (…)

2. Since you were given free maize inputs how did you access the extension messages on maize production? Field days (…), Extension officers visiting your farm (…) trainings at groups meetings (…) exposure visits (…) others …….

3. How many times did you receive the extension messages on maize production since you received free maize inputs? Ounce (…) twice (….) more than twice (…)

4. What was the level of benefit of the following extension messages? Tick in table below.

Message	Level of benefit		
	Quite Beneficial	Moderately beneficial	Not beneficial
Maize spacing and date of planting			
Maize variety suitable to your farm			
Kinds and uses of fertilizers in maize			
Savings mobilization			
Market linkages			

5. Do you think the extension messages were timely? Yes .... No....

6. Do you feel the extension messages were appropriate? Yes ....no....

7. What has been the impact of NAAIAP programme on the following on maize production?

Aspect	Negative impact	No impact	Moderate positive impact	A lot of positive impact
Access to certified maize seeds				
Access to right fertilizer for maize planting				
Access to right fertilizer for top dressing maize				
Access to credit /finance to buy maize inputs				

Thank you for your time

APPENDIX 3: LETTER OF RESEARCH AUTHORIZATION

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254 020-241349, 2213102
254-020-310571, 2213123
Fax: 254-020-2213215, 318245, 318249
When replying please quote

P.O Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: NCST/RRI/12/1/AS-011/21/5

Date: 6th June, 2011

Anthony Njurai Njogu
University of Nairobi
P. O. Box 3054
MERU

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on **"Impact of the national accelerated agricultural inputs access project on maize production: A case of Itabua Location Embu District, Kenya"** I am pleased to inform you that you have been authorized to undertake research **in Embu District** for a period ending ***31st July, 2011.***

You are advised to report to **the District Commissioner, the District & Divisional Agricultural Officers & the District Education Officer, Embu District** before embarking on the research project.

On completion of the research, you are expected to submit **one hard copy and one soft copy** of the research report/thesis to our office.

P. N. NYAKUNDI
FOR: SECRETARY/CEO

Copy to:

The District Commissioner
Embu District

The District Agricultural Officer
Embu District

APPENDIX 4: COPY OF RESEARCH PERMIT

PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss ANTHONY NJURAI NJOGU

of (Address) UNIVERSITY OF NAIROBI BOX 3054 MERU

has been permitted to conduct research in .....Location,

EMBU .....District,

.....EASTERN.....Province,

on the topic IMPACT OF THE NATIONAL ACCELERATED AGRICULTURAL INPUTS ACCESS PROJECT ON MAIZE PRODUCTION: A CASE OF ITABUA LOCATION EMBU DISTRICT, KENYA.

for a period ending 30TH JULY ,20.11

PAGE 3

NCST/RRI/12/1/AS-011/21

Research Permit No.....

Date of issue 6/6/2011

Fee received KSHS.1000

Applicant's Signature

Secretary National Council for Science and Technology

APPENDIX 4: COPY OF RESEARCH PERMIT

PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss. ANTHONY NJURAI NJOGU

of (Address) ...UNIVERSITY OF NAIROBI BOX 3054 MERU

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.....Location,

EMBU .....District,

.....EASTERN.....Province,

on the topic.....IMPACT OF THE NATIONAL ACCELERATED AGRICULTURAL INPUTS ACCESS PROJECT ON MAIZE PRODUCTION: A CASE OF ITABUA LOCATION EMBU DISTRICT, KENYA.

for a period ending.....30TH JULY.....,20.11.....

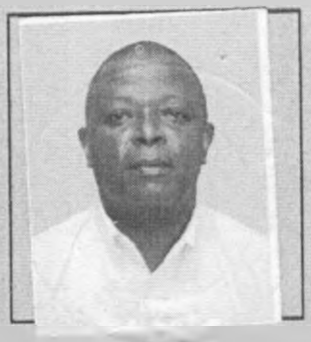
PAGE 3

NCST/RRI/12/1/AS-011/21

Research Permit No.....

Date of issue.....6/6/2011

Fee received.....KSHS.1000



.....
Applicant's Signature

.....
Secretary
National Council for Science and Technology