INFLUENCE OF FARM INPUTS ON MAIZE PRODUCTION IN KIMININI SUB -COUNTY, TRANS NZOIA COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfillment for the Requirements of the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi.

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DECLARATION

I declare that this research project report is my original work and has not been presented for award of degree in this or any other university.

…… ……..

Nelson Makokha Mayeku **Date**

L50/85026/2016

This research project report has been submitted for examination with my approval as the university supervisor.

…… ……

Dr. Joash Migosi **Date**

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DEDICATION

I dedicate this project to my wife Lylian for moral and financial support during my study period, my children Bonface and Abigael for their understanding and cooperation in the course of my study.

ACKNOWLEDGEMENT

I would like to express my sincere appreciation to my supervisors Dr. Joash Migosi for tirelessly guiding me in the development of this research proposal. Much appreciation goes to my parents, my family, and friends for their moral, financial and social support. Above all, I would like to thank the Almighty God for giving strength to do all this work without which I would not have managed.

Many thanks to my lecturers for M.A in project planning and management for their support in the various units they were handling especially their dedication and commitment while teaching research methods in our class, Dr. Patrick Simiyu, Dr. Okello, Prof. Odundo, and Dr. Kikechi for their understanding, moral support and providing an enabling environment for my studies. Finally, my sincere thanks goes to all respondent who took part in this research.

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

EU:	European
EUROSTAT:	European Statistics
USA:	United States of America
GDP:	Gross Domestic Produce
ISP:	Input Subsidy Programme
WFP:	World Food Programme
EAGC:	East African Grain Council
CGA:	Cereal Growers Association

ABSTRACT

Maize production has been dwindling over the years. This has resulted into food insecurity for an ever-growing population. This led the researcher to carry out a research on influence of farm inputs on maize production in Kiminini Sub County, Trans Nzoia County, Kenya. Specifically, the study sought the following objectives: Determined the influence of Fertilizer use on maize production in Kiminini Sub County; determined how adoption of technology influences maize production in Kiminini Sub County; evaluated the influence of use of herbicides on maize production in Kiminini Sub County; evaluated the influence of using Certified seeds on maize production in Kiminini Sub County. The research findings helped the government policy makers in coming up with policies that helped farmers towards the improvement of maize production. It also helped researchers, as the study filled gaps in the body of knowledge and on farmers maize production. The study was delimited to maize farmers as opposed to other cereals and Kiminini Sub County. The researcher worked with the assumptions that the questionnaires would be answered in full and that they would be returned and used in data analysis. Descriptive survey design was used in this study. The target population for this study was therefore 12,284 maize farmers. The sample size was 410 respondents. For this study, the researcher used questionnaires as data collection tool. A sample equivalent to 10% of the study sample was enough for piloting the study Instruments. The pilot study was done in the neighbouring Tongaren sub county as the two sub counties shared similar characteristics. Content validity of the instrument was determined by colleagues and experts in research. The frequencies and percentages were then used to determine the factors influencing maize production by farmers. The findings showed that the farmers did not receive any soil testing facilities. This is shown by 263 (93.93%). Despite 161(57.50%) agreeing to fertilizer increasing the maize yields. Farmers also disagreed to using herbicides on their farms. This is shown by 165(58.93%). 174(62.14%) of the farmers disagreed to availability of extension officers. The researcher recommended that all the farmers should be allowed access to soil testing facilities through advocacy. The prices of fertilizers should also be stabilized to allow for proper planning for the season of maize production. Certified seeds should be availed to all farmers at a subsidized rate to avoid farmers using the wrong seed due to their fair prices. .

CHAPTER ONE
INTRODUCTION

1.1 Background to the study

Maize is vital for global food security and poverty reduction. The cropping area within the 27 member states of the European Union (EU) reached 8.3 million hectares in 2007 for grain maize. The largest maize producers are France, Romania, Germany, Hungary and Italy, where maize is grown on more than 1 million hectares each (EUROSTAT 2007). However, yield and quality of maize are at risk by animal pests, weeds and pathogens (Oerke 2006).

The United States of America (USA) is the largest producer of maize contributes nearly 35 % of the total production in the world and maize is the driver of the US economy. The USA has the highest productivity of more than 9.6 T/ha which is double that of the global average at 4.92 T/ha. Maize grain yields increased from 54.7 bushels per acre in 1960 to 147 bushels per acre in 2011 (United States Department of Agriculture, 2012).

In India, maize is the third most important food crops after rice and wheat. The average productivity in India is 2.43 T/ha.According to advance estimate it is cultivated in 8.7 m ha (2010-11) mainly during Kharif season which covers 80% area. Maize in India, contributes nearly 9 % in the national food basket and more than Rs. 100 billion to the agricultural GDP apart from the generating employment to over 100 million man-days at the farm and downstream agricultural and industrial sectors.

In Africa, maize is the most widely grown staple crop. Due to the increasing demand for feed and bio-energy, the demand for maize is growing and is expected to double by 2050 (Rosegrant et al. 2007). In Cote d'Ivoire maize is consumed as a whole grains, couscous, or Tôh which is the cooked corn flour. However, it produces very little maize. As a whole, In

Africa, maize yields (output per acre) have fallen in the last decade, in spite of improvements in agricultural technologies (Suri 2011). This is further complicated by the threat of climate change, which will make it more difficult to meet the growing demand for maize (Rosegrant et al. 2009). This is worrisome for economic and social policies aimed at increasing food production and agricultural incomes.

Maize is also the most important grain crop in South Africa and it is produced throughout the country under diverse environments. Successful maize production depends on the correct application of production inputs that will sustain the environment as well as agricultural production. These inputs are, inter alia, adapt amount of this crop which is neither sufficient to satisfy the needs of its inhabitants nor the livestock. According to the Ministry of Agriculture report (2010) the estimated annual average production since 2000 to 2009 was 604 '031 tons on an average of 291'852 hectares and it was approximately 2.3 tons per hectare (Yeo, 2011). The country therefore fulfills the deficit by importing from Argentina (Anonymous, 2010).

The establishment of Ethiopia's input program in 1994 coincided with some increase in maize yields, though this was also a time of political conflict. The largest yield increase over the 20-year period was 2006, which was preceded by the end of a drought and an increase in cereal prices. Though maize yields have increased in Ethiopia over the last two decades, input use remains low relative to neighboring countries, and some authors argue that inflexible input packages have contributed to low rates of input use.

In Ghana, Maize is one of the most popular food crops on the domestic market and is grown in all the ecological zones of Ghana. It is the basis of many local food preparations and is the main foodstuff for poultry and other livestock (FASDEP, 2012). However, there are food shortages and the main cause of food shortage has been failure of production of maize to keep

pace with the linear increase in population. The feasibility to increase per unit yield is more because yield potential of maize crop has not been realized so far, as there is a large gap between potential and actual yield per acre (Khan et al., 2013).

Malawi's Input Subsidy Program (ISP) started in 2005, a year prior to increases in maize yield despite rising fertilizer and transportation costs. Yield continued to rise the following year, after the Growth and Development Strategy was established in 2006. Malawi's total agriculture expenditure is among the highest in East Africa, but yields have remained relatively constant since 2009. However, In Tanzania, increase in maize yield in 2010 followed the introduction of fertilizer vouchers and tax exemptions in 2009. National agricultural spending increased from 2007 to 2010, but then dropped, the yields have also dropped.

Rwanda's maize yield began to rise after 2007 and continued to rise through 2011, preceded by a Crop Intensification Program and Economic Development and Poverty Reduction Strategy. Though maize yields leveled out after 2010, production has continued to grow steadily. On the other hand, neighbouring Uganda's maize yield increased dramatically in 2008 during the world food crisis and an increase in the domestic price of maize. Donor and national agriculture expenditures peaked in 2009 and have been high and yields have increased steadily.

Maize is a staple food in Kenya and it is grown in almost every farm. It accounts for about 40% of daily calories Morris, M.L., R. Tripp, and A.A. Dankyi. (1999.)and has a per capita consumption of 98 Kg, this translates to between 30 and 34 million bags (2.7 – 3.0 metric tonnes) of annual maize consumption in Kenya. Over the years domestic production has stagnated and the quantity imported has increased Ouma, J., et al (2002). Over 85% of the rural population derives their livelihood from agriculture most of whom engage in maize

production. Kenyan maize yield rose in 1994 as farmers gained access to fertilizer through private sector cooperatives, maize meal prices were deregulated, and import tariffs were removed. Another increase in yield in 2010 was preceded by an Economic Stimulus Program, adoption of a National Land Policy, and an input subsidy and distribution program. Though national agriculture spending rose after the introduction of these programs, it has subsequently decreased, and yields have remained constant since 2010 while the population has continued to grow hence leading to shortages. Shortage of maize in Kenya results in food insecurity or famine among the poor urban and rural households.

Future increase in maize production will heavily depend on yield improvement rather than expansion in area under production. Kenyan government policy objective for maize sub-sector is to encourage increased production so that self-sufficiency and food security can be achieved. Some of the reasons for the dwindling performance in maize production are associated with the constraints along the maize value chain. Key among the constraints are; inadequate use of recommended technologies, high cost of inputs, wrong usage of herbicides, and the non among others World Food Programme (WFP), East African Grain Council (EAGC) and Cereal Growers Associations (CGA). This is what has prompted the need to find out the factors affecting maize production in KimininiSub County which falls in the major maize producing zones in Kenya.

1.2 Statement of the problem

Food production in sub-Saharan Africa is slower than the population growth rate. And unless present trends are reversed, 25 years from now Africa will have the lowest production of cereals leading to large deficits. The solution will be to import food supplies adequate to offset these deficits. However, this will not be feasible just as it will not be sustainable. Hence, there is need to manage the Soil fertility more efficiently if Africa is to overcome its

food-production problems. Mineral fertilizers and improved certified maize seeds are crucial to such efficiency. New technologies also need to be adopted in the use of herbicides coupled with improved farming methods.

1.3 Purpose of the study

The purpose of the study was to determine the influence of farm inputs on maize production in Kiminini Sub County, Trans Nzoia County, Kenya

1.4. The Objectives of the Study

1. To evaluate the influence of Fertilizer use on maize production in Kiminini Sub County.
2. To determine how adoption of technology influences maize production in Kiminini Sub County
3. To assess the influence of use of herbicides on maize production in Kiminini Sub County
4. To establish the influence of using Certified seeds on maize production in Kiminini Sub County

1.5 Research questions

1. How does the use of fertilizer influence maize production in Kiminini Sub County?
2. How does the adoption of technology influence maize production in Kiminini Sub County?
3. How does the use of herbicides influence maize production in Kiminini Sub County?
4. How does the use of certified seed influence maize production in Kiminini Sub County?

1.6 Significance of the Study

The study would be of importance to various stakeholders. The research findings would help the government policy makers in coming up with policies that was beneficial to the farmers towards the improvement of maize production. It would also be beneficial to researchers as the study would fill gaps in the body of knowledge. Farmers would also benefit as they understood the influence of the factors under study in maize production. Scholars also used the findings as reference materials for further research.

1.7 Delimitations of the Study

Delimitations refer to the scope of the study. In this study, the study would be delimited to maize farmers as opposed to other cereals. The study would also be delimited to Kiminini Sub County despite there being other sub counties within Trans Nzoia County.

1.8 Limitation of the Study

The researcher anticipates some limitations in the course of the study. Some of limitations include the respondents not being truthful in the answering of questions. However, the researcher would ensure that the respondents understand the importance of giving truthful answers. The researcher would also ensure the respondents that the study is for academic purposes only and hence the importance of true answers to the questions.

1.9 Assumptions of the Study

The assumptions of this study were that the questionnaires would be answered in full and that they would all be returned and used in data analysis.

1.10 Definition of Operational Terms

Influence: The action or process of producing effects on the actions, behavior, opinions of another thing or other people.

Factors: An element that brings about a certain particular result or situation

Maize: A large plant that yields large grains used for their nutritional value

Production: The action of making or manufacturing something from inputs

Fertilizers: A chemical or natural substance added to the soil to increase fertility

Herbicides: Chemical substances used to control weeds

Certified seeds: A product of plant breeding

Technology: The knowledge of techniques of processes

1.11. Organization of the Study

The proposal has three chapters. Chapter one would focus on introduction, background to the study, problem statement, purpose and objectives of the study, research questions, significance, limitations, delimitations, and assumptions of the study and definition of terms.

Chapter two is the literature review. Chapter two would be organized according to the thematic objectives of the study. A theoretical framework, conceptual framework, research gap and summary of literature review at the end.

Chapter three would represent; research design, target population, sampling procedure and sample size, research instruments, data collection procedure and analysis and operationalization of study variables.

Chapter four covered data presentation, analysis and discussion of findings.

Chapter five included summary of the research findings, conclusion and recommendations of the study.

CHAPTER TWO
LITERATURE REVIEW

2.1. Introduction

Production of maize was associated with several agricultural and climatic factors such as humidity, temperature, soil texture, soil fertility and soil erosion. The decline in soil fertility and soil erosion reinforce pressure on land and justify low yields improvement in context of population growth and rapid urbanization (Agridea, 2007).

2.2 Influence of fertilizer on maize production.

Fertilizer use was responsible for a large part of sustained crop productivity worldwide (Sanchez et al., 1997). Fertilizers have been shown to produce variable crop yield responses under farming conditions across locations and between fields. All the necessary micro and macro nutrients are required at higher amounts for the higher production of maize and deficiencies of these elements lead to decreases in growth. Consequently, application of chemical fertilizers help to overcome the nutrient deficiencies but excess use of these chemical fertilizers reduced the soil fertility by changing soil pH. (Crawford et al., 2008)

(Crawford et al., 2008) also found out that Europe and Americas growth rates in fertilizer consumption are particularly high, in part because the real price of fertilizer is higher in Africa than in many other regions. As subsidies have been removed and exchange-rate distortions corrected over the past decade or more, relative prices paid by farmers have risen to reflect more closely the economic cost of fertilizer. Consumption growth has thus slowed even more. Nonetheless, during the period of declining growth in consumption, fertilizer use on cereals, particularly maize, has become relatively more important than use on cash crops.

Several studies have suggested that large increases in fertilizer usage are necessary to correct the massive nutrient losses of much of the arable land in Sub Saharan Africa. (SSA) (Morris et al 2007; Heisey and Mwangi, 1997; Wallace and Knausenberger, 1997). Currently, SSA

has the lowest fertilizer application rates of any region, with application rates around 10 kg/Ha. Africa contains 25 percent of the world's arable land, yet represents less than 1 percent of global fertilizer consumption (Kariuki, 2011). As of 2010, fertilizer use in Ghana was well below the average in SSA at less than 6 kg/Ha (FAOstat, 2014).

In sub-Saharan Africa, greater use of mineral fertilizers is crucial to increasing food production and slowing the rate of environmental degradation. The choice of soil fertility management strategies by farmers is affected by the amount of nutrient resources available, labour requirements and the availability of land and draught power. Intensity of use of nutrient resources differs on different farms, as farmers have different access to resources.

Strategies for increasing fertilizer use should thus direct more attention to maize and other important staples. In higher potential areas, some fertilizer use on maize is often economically profitable even at higher relative prices of fertilizer. Additional research on the limiting nutrient under farmers' conditions or on the interactions between nutrients and other crop-management factors could help to increase profitability.

Maize fertilizers mainly used in Zimbabwe for supply of N, P, K, S are compound D (7% N:14% P2O5:7% K2O:6.5% S) applied as a basal fertilizer, and ammonium nitrate (AN), with 34.5% N, applied as a top dressing fertilizer (Ahmed et al., 1997). Compound Z containing 1% Zn has been on the market but the majority of farmers prefer to use standard macronutrient fertilizers which are cheaper. This has a negative feed-back on fertilizer manufacturers who lower production due to less demand. This consequently exacerbates micronutrients deficiencies especially in sensitive crops such as maize (Alloway, 2004). Zinc deficiency affect grain yield to a relatively greater extent compared to dry matter production probably due to impaired flower formation and pollen fertility among other factors.

Historically, Ghana has seen some fluctuations in fertilizer usage, but the rates have always remained relatively low (FAO, 2005). Fertilizer application rates are relatively low for all crops, but the rates average slightly higher on maize fields; application rates average around 14 kg/Ha on maize fields, accounting for about 64 percent of total fertilizer use (Heisey and Mwangi, 1997; Kherallah et al., 2002). Average fertilizer use on maize fields is higher than on all fields in Ghana, but the application rates are still low. Numerous studies have shown that increasing these fertilizer-use rates and the efficiency of its application can significantly increase agricultural yields, so in an effort to increase yields through increasing fertilizer use, in 2008 Ghana launched the fertilizer and seed subsidy program (Ersado et al., 2003; Kherallah et al., 2002).

According to Kolawole (2014), period of fertilizer application also affect the crop production and the most critical period for fertilizer application is flowering approach (15-20 days before and after). It is now recognized that for Africa to jumpstart the wheel of economic development, there is need to invest in agriculture which is the major economic activity. This would earn funds that can be invested in other economic activities for increased economic development. It is this realization that prompted the African Union through the New Partnership for Africa's Development (NEPAD) to initiate a move for the governments to commit them to gradually increase budgetary allocation to agricultural development to 10% under Maputo declaration. Increasing fertilizer use is seen as a key input in breaking the low productivity trap.

Less than 30% of the farmers in high potential areas who own about one acre of land use fertilizers and improved seeds in lower potential areas, fertilizers and certified seeds use is less than 20% of the farmers in the same category. The main reason for this phenomenon is that resource poor farmers do not have the know-how and cannot afford the cost of these inputs. The consequence is that soils are depleted of nutrients and farmers obtain low yield.

This is the main cause not only of declining agricultural productivity but also of increasing food insecurity and abject poverty Namazi E, Lack S, Nejad EF (2015). The path to prosperity in Kenya begin at the field of Kenyan farmers who unlike many farmers almost anywhere else in the world, do not produce enough food to nourish their families, communities or the growing population. The facts are well known, our country's population is chronically undernourished, and most of our farmers lack access to productive crop varieties, adequate water resources, soil nutrients, poor road infrastructure, weak and ineffective research and extension farmer linkages. The maize farm input subsidy program is an initiative of the government of Kenya that seek to address the problem of food insecurity and poverty among resource poor farmers by assisting them with agricultural inputs for a given period of time with comprehensive training and capacity building.

In Bungoma, Simiyu 2013 found out that, most farmers did not use government subsidized fertilizer hence, only 47.52% used government subsidized fertilizer while 52.48% did not use it. These findings showed that a good number of farmers did not use government subsidized fertilizer, it means they apply inadequate fertilizer since it is the most costly input. This is in agreement with (Heisey, P.W., and W. Mwangi. 1996.), who said that though important in soil fertility improvement it has been reported that, farmers typically apply 36 inorganic fertilizers at rates well below recommended levels, or not at all. This is because fertilizer prices can influence negatively or positively maize yields; if the price decreases farmers purchase more meaning they will apply more leading to higher yields and if it increases farmers purchase less, therefore apply less and therefore get less yields, (Wanyama, et al., 2010).

2.3 Influence of technology on maize production

According to (Karlen and Kasperbauer, 1989). Use of advanced machinery technology is responsible for the increases in maize yield in America and European countries. This has also

been maintained throughout the years and most of the agricultural farmlands are mechanized. This has contributed to the high yields as the labour efficiency is high leading to high yields per acre. Other factors that increase rate or efficiency of production include orientation of kernels in the soil at planting. This influences germination rate (Patten and Van Doren, 1970), leaf orientation of plants within the canopy (Fortin & Pierce, 1996), and cardinal direction in which the row is planted, both of which can allow more light to penetrate into the canopy and reach leaves responsible for grain filling.

In another study, it was determined that Spacing of plants within a rows can change the amount of light available to a plant; total plant yield can be increased when competition from neighboring plants is reduced (Nielson, 2001). As plant population is increased, the spacing between plants within a row is decreased. The close proximity of other plants will increase interplant competition. By controlling the direction of kernels at planting, direction of leaves can be manipulated in the canopy as the plant grows (Fortin and Pierce, 1996) and potentially decrease the degree of competition.

In Another study, the technology of altering interplant shading, compass direction of maize rows may alter grain yield. In addition, through altering early leaf direction, orientation of planted seeds may alter interplant shading. The impacts of row direction and seed orientation were studied in central Illinois in two experiments. Based on weight of shelled grain at maturity, grain yields were greater for kernels planted with their germ facing adjacent rows than facing their own row, and both manually planted orientations were greater than for mechanically planted grain due to lighter kernel weight and fewer kernels per ear for randomly planted seeds. Koopman (1989).

In his study, Simiyu (2013) found out that only 36.63% of the farmers used irrigation on their farms at times while 63.37% did not, only 27.72% used minimum tillage while 63.86% did

not, 72.28% had heard of dry planting while 27.72 did not, only 25.70% practiced dry planting while 74.30% did not practice dry planting, did not practice minimum tillage neither did they irrigate their crops. This showed that most farmers do not use modern technologies in crop production. The study findings were also found to concur with the conclusion made by V. N. Ozowa, (1995), that says agricultural technology for the small scale farmer must help minimize the weight of farm chores. It should be labor-saving, labor enhancing and labor-enlarging which save labour and cost of production.

2.4 Influence of herbicides on maize production

Successful cultivation of maize depends largely on the efficacy of weed control. Weed control during the first six to eight weeks after planting is crucial, because weeds compete vigorously with the crop for nutrients and water during this period. Annual yield losses occur as a result of weed infestations in cultivated crops. The annual yield loss in maize due to weed problems is estimated to be approximately 10 %. The loss occurs as a result of weed competition for nutrients, water and light. The presence of weeds during harvesting may slow the process, pollute grain with seeds, transmit odours to grain, causing downgrading, or incur additional costs for removal of seeds. Certain seeds, such as those of the thorn apple (Datura), may be poisonous when consumed by animals or humans.

According to Pop & Csider (2014), Maize and winter wheat are the most important produced crops in Europe, yet Yield losses caused by pests, pathogens and weeds are major challenges to agricultural production. Conventional high yielding maize production is directly connected with weed control. Successful weed control in maize crop is characterized by implementation of different supportive and aimed measures (Simić et al., 2014b). The system of measures is planned according to weed community composition and species abundance at certain agro ecological conditions.

Weed competition affects physiological processes in maize plants and modifies their morphology. It affects their light use efficiency and physiological processes relevant for productivity, such as chlorophyll and carotenoids contents (Spasojevic et al., 2014). Plant canopies can be structurally characterized by their harvest and leaf area index. Those two indices illustrate the intensity of stress and pressure present in plant stand, caused by presence of weeds and their biomass. Long-term experiments are excellent method for comparing cropping systems. The aim of the research was to determine advantages of two crop rotation in comparison to continuous maize growing in combination with different herbicides level, i.e. the weed control effectiveness and crop morphological and physiological parameters, which are important for maize competitiveness and productivity.

The ultimate yields of maize are controlled by a number of genetic and external factors (Ahmed et al., 2001). The yield of maize is greatly affected by weeds in the field. Weeds are a constant source of concern for the successful growth and development of economic crop. They compete with crops for light, moisture, space and nutrients and consequently interfere with the normal growth of crops. Weed control therefore, is very essential in maize cultivation. The critical period of weed interference in maize is influenced by the competing weed species, cultivars, plant density and environmental factors such as light, water, nutrient and allelopathy (Poku and Akobundu, 1985). Yield loss of up to about 39.8% has been reported in maize (Oudejans, 1991).

Maize is very susceptible to competition from weeds especially in the early stages of growth; therefore, efficient control at the pre- and early post-emergence stages is essential. Once maize reaches approximately 0.5 m in height, weed control no longer affects yield (Marshall, 2004). Weed interference not only results in crop losses but also increases insect pest damage, harvesting difficulties and crop contamination (Ohene, 1998). It is generally

conceded that the recurrent economic damage to agriculture from weeds far surpasses the more incidental damage inflicted by insect pest, rodents and diseases (Oudejans, 1991).

Attention must therefore be focused on weed control measures so as to maintain the competitive ability of the threatened crop by minimizing weed interference during the growth phases of crop. The nature of weed interference influences strongly the choice of weed control measures. The methods of weed control are cultural, biological and chemical. Chemicals are increasingly being used in Ghana and other developing countries for the control of weeds in maize because they offer an effective and relatively inexpensive means for managing cereals weed problems. Several herbicides have been identified for weed control in maize and are applied at various stages of development; hence, they are classified according to their time of application as preplant, pre-emergence, or post emergence (G.G.D.P, 1991).

The increase in grain yield apparently, resulted from better weed control that was provided by the herbicide application as well as the hand weeding at the early stages (4WAP) of development of maize substantiating the findings of other research workers (Rout and Satapathy, 1996). Grain yield was not significantly different from the control. This indicates that when weeds are controlled at early stages (4 to 6 WAP) of development, competition of weeds with crop plants are reduced (James et al., 2000). Jughenheimer (1976) reported that the yield of maize is greatly influenced by the number of kernel rows and the hundred seed weight as well as in the length and diameter of the maize ears.

In his study, Simiyu(2013), the respondents agreed that the use of herbicides minimized weeds, consequently leading to increased maize yields. However, only 89.11% had heard of herbicides while 10.89% had never heard of herbicides. This was an indicator that some

farmers still struggled to access the herbicides or better still they could not afford the herbicides due to the cost implications hence leading to low yields.

2.5 Influence of certified seeds on maize production

Field trials at agricultural stations across Kenya have developed high-yielding seed varieties, optimal fertilizer application rates and increased farmer field days as demonstration projects (Karanja 1996; Duflo et al. 2008). Despite this, adoption rates of improved maize varieties and fertilizers remain low. This is in sharp contrast to other countries such as the United States that have fully adopted high yielding varieties (HYV).this was in agreement with (Dorfman 1996) who found out that I n spite of the higher productivity of certified seed and fertilizer relative to other practices, small scale farmers are seen to be slow in adoption. Many attempts have been made to investigate the reasons for the partial adoption, but few have studied the subsequent impact of packaged multiple technologies.

Maize hybrid seed provides farmers with varieties containing improved genetics, such as high yield potential and unique trait combinations to counter diseases and adverse growing conditions. However, the quality of hybrid seed depends greatly on field production methods, both in adherence to quality assurance standards and implementation of appropriate agronomic management. While open pollinated maize seed production is relatively straightforward, hybrid seed production requires additional field practices that are critical to success.

The rules and procedures for certified seed production are laid down in the national seed regulations of the country in which the seed is to be produced. The aim of certification is to produce seed with an acceptable level of genetic purity and a specified seed quality in terms of minimum germination percentage (usually 90% for maize), maximum seed moisture (12.5%) and minimum seed purity (99% pure seed with less than 3% total defects).

Certification procedures are based on standards for growing conditions (e.g., field history, isolation, female-male identity preservation, removal of off-types and detasseling of female

plants in the case of hybrid production), field inspections, prevalence of weed seeds, proportion of defective seeds, germination percentage and seed moisture content. If a seed field or seed lot does not meet the prescribed standards for the intended seed class, it will be rejected for certification. Consequently, seed producers must be familiar with and adhere to the national seed regulations for the seed class that is being grown. John F. Mac Robert, Peter Setimela, James Gethi and MosisaWorkuRegasa (2014)

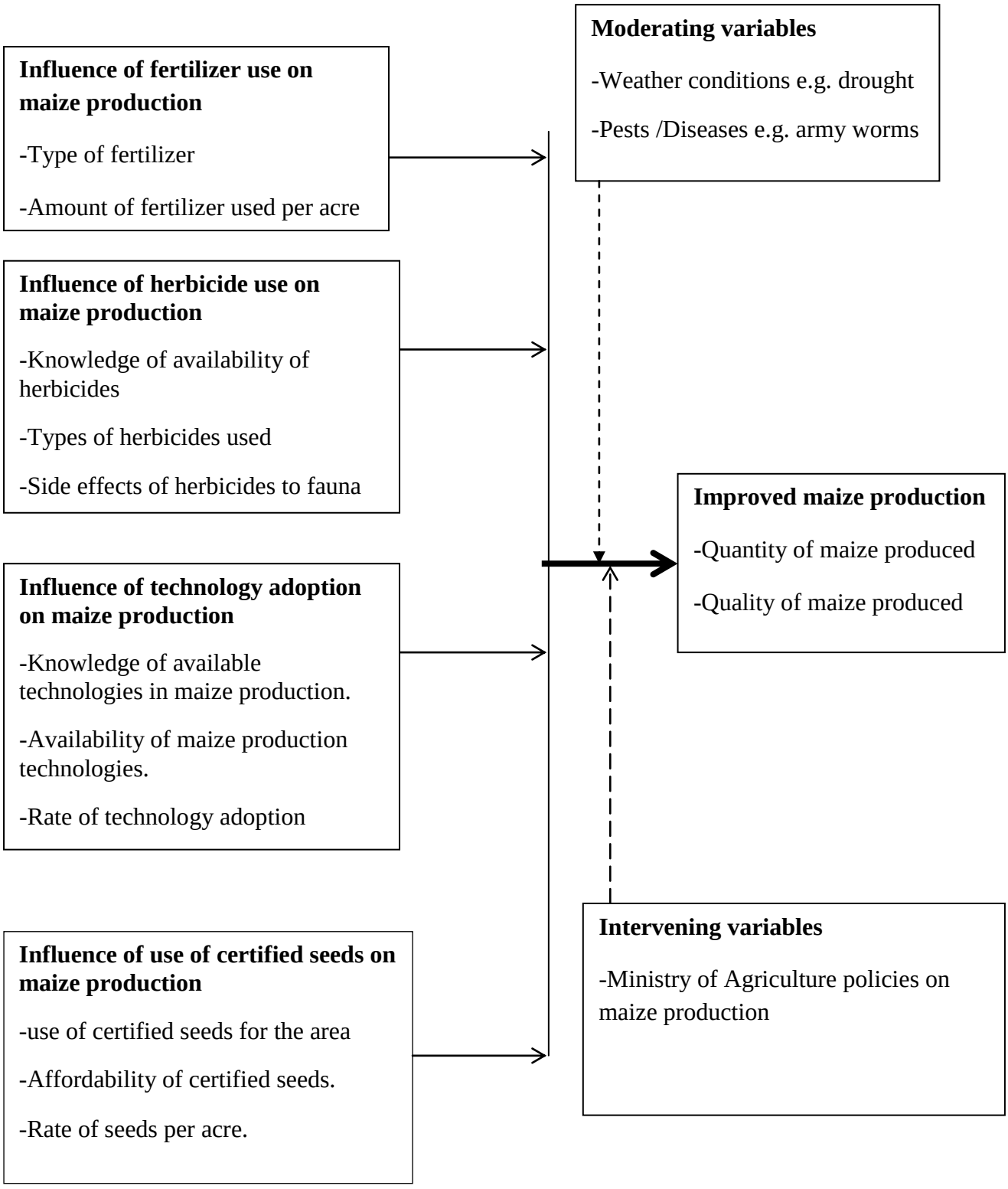
For decades, Kenya has been depicted a maize "success story" in Sub-Saharan Africa, known for rates of hybrid maize adoption during the 1960s and 70s that paralleled those of the U.S. Corn Belt thirty years earlier (Gerhart 1975; Byerlee and Eicher 1997; Smale and Jayne 2010). Over the past few decades, however, a general perception of stagnating adoption and production (Hassan 1996; De Groote 2005) has been supported by FAO data and a rising maize import bill. Replacement of older hybrids by newer releases appears to have been slow (Hassan 1998; Smale, Olwande and De Groote, forthcoming), dampening yield potential on farms. For example, a hybrid released in 1986 and derived from this first hybrid still dominates the maize fields of Kenya, despite the dramatic increase in the number of hybrids and breadth of seed suppliers' seed markets liberalize (Swanckaert 2012).

A seed sector study conducted by Nambiro et al. (2004) in the Trans Nzoia District found some impact of the liberalization of the seed industry on the distribution side, where private retailers had broken the previous monopoly of the Kenya Farmers' Association. However, according to the authors, at the impact of seed liberalization on maize production was minimal. At that time, they estimated that KSC provided 97% of the seed, dominated by one variety. There is some more recent evidence that liberalization has led to entry of new seed companies in the maize market. In her thesis, Swanckaert (2012) reports that while KSC was the only maize seed company prior to 1992, currently there are 11 companies with varieties 4 registered to their names.

Currently, the plant variety registry of the Kenya Plant Health Inspectorate (KEPHIS) lists 164 varieties released from 1964 up to 2009, with 85 percent of these registered since 2000. The numbers of improved maize varieties and hybrids grown on farms has also increased tremendously. While Hassan (1998) found only 12 hybrids grown by farmers in 1992, Tegemeo data indicate that the number of hybrids on farms was 33 in 2004 to 50 in 2010. Nonetheless, Swanckaert (2012) concludes that although competition in the seed market has intensified, the impact of new seed companies on market concentration has been smaller than expected.

Mwabu et al. (2007) applied a bivariate probit model to explore the relationship of adoption of improved varieties to poverty of households in rural districts of Laikipia and Suba. They found a negative correlation between poverty and adoption of improved maize seed. During the last 50 years, agricultural production has been increased dramatically because of the availability of high yielding varieties and synthetic fertilizers. There was tremendous growth in maize production between 1964 and 1997 fuelled by the introduction of hybrid maize and related technologies often dubbed "Kenya's Green Revolution". However, there has been a marked decline in yield since 1997. Maize yield have declined from 1.85 metric tonnes per hectare in the period 1985 – 1989 to the current yield of 1.57 metric tonnes per hectare. Advances in seed genetics and plant health permitting planting densities to increase, are responsible for the increases in maize yields.

2.7 Conceptual Framework



2.8 Research gap

The researcher therefore acknowledged that there was very little comprehensive research focusing on how specifically the individual factors affecting maize farming affect the quantities of maize collected. No single factor has been identified as the factor affecting the quantity of maize collected more than the other does. The research also notes that the farmers lack the technical information about all the factors affecting the maize farming practice and as such they have failed to be able to explain why their maize quantities are declining despite the efforts to adopt latest equipment's to boost the production of maize.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a brief overview of various steps and methods that the research employed in the study. It gives a description of the research design used, target population, sample and sampling procedure, instruments for data collection ,validity and reliability of the research instruments, data collection procedures and data analysis.

3.2. Research design

According to Kothari (2004), a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Descriptive research studies are studies that are concerned with describing the characteristics of a particular individual, or a group. Descriptive survey design will be used in this study. This is because the descriptive design will assist the researcher in collecting data from a relatively larger number of cases at a particular time. The descriptive survey design will also help to answer the questions like who, what, where and how on describing the phenomenon in the study. This design will be appropriate for the study because it will enable data collection from the sample on the factors influencing maize production among farmers.

3.3. Target Population

Target population is that population that the researcher wants to generalize the results of the study. Mugenda and Mugenda (2003) define target population as the entire group a researcher is interested in or the group about which the researcher wishes to draw conclusion. According to the records from the Ministry of Agriculture Kiminini Sub County. The Sub County has a

population of 12,284 farmers by the year 2015 (Ministry of Agriculture Kiminini Sub County Office, 2015). The target population for this study will therefore be 12,284 maize farmers.

3.4. Sample Size and Sampling Procedure

A sample size is a sub-set of the total population that is used to give the general views of the target population (Kothari 2004).The sample size must be a representative of the population on which the researcher would wish to generalize the research findings. This section presents the method that will be used to determine the study sample size from which data will be collected. It also describes the sampling techniques that will be used in selecting elements to be included as the subjects of the study sample.

3.4.1 Sample Size Determination

The researcher will use 30% of the target population. This is according to Mugenda and Mugenda 2014.

3.4.2 Sampling Procedure.

This is the act of selecting a suitable sample or a representative part of a population for the purpose of determining characteristic of the whole population (Frankel &Wallen, 2004). The sample size for the study was 409. Proportional allocation will be used to determine the sample size from the wards. To select individuals from the wards to participate in the study, systematic random sampling will be used, whereby using farmers' lists, the names of the respondents were chosen at an interval.

3.5 Data Collection Instruments

Creswell (2003) indicates that research instruments are the tools used in the collection of data on the phenomenon of the study. A questionnaire according to Mugenda and Mugenda (2004) is a list of standard questions prepared to fit a certain inquiry. For this study the researcher will use questionnaires to get information from the selected farmers in Kiminini Sub County.

According to Mugenda and Mugenda (2004), a sample equivalent to 10% of the study sample is enough for piloting the study Instruments. The research instruments will be piloted in order to standardize them before the actual study. The pilot study will be done in the neighbouring Tongaren sub county as the two sub counties shared similar characteristics. This will help in identifying problems that respondents might encounter and determined if the items in the research instrument will yield the required data for the study.

3.5.2 Validity of the Instruments

Validity is defined as the appropriateness, correctness, and meaningfulness of the specific inferences which are selected on research results (Frankel & Wallen, 2004). It is the degree to which results obtained from the data analysis actually represent the phenomenon under study. This research study concerned itself with content validity. Content validity according to Kothari (2004) is the extent to which a measuring instrument provides adequate coverage of the topic under study. Content validity ensures that the instruments covered the subject matter of the study as intended by the researcher. Therefore, content validity of the instrument was determined by colleagues and experts in research who looked at the measuring technique and coverage of specific areas (objectives) covered by the study. The experts then advised the researcher on the items to be corrected. The corrections on the identified questions were incorporated in the instrument hence fine tuning the items to increase its validity.

Validity was ascertained by checking whether the questions were measuring what they are supposed to measure such as the clarity of wording and whether the respondents interpreted all questions in the similar ways. The researcher through revealing the areas causing confusion established validity, ambiguity, and this led to reshaping of the questions to be more understandable by the respondents and to gather uniform responses across various respondents.

3.5.3 Reliability of the Instruments

Mugenda and Mugenda 2003, research instruments are expected to yield the same results with repeated trials under similar conditions. These regard outcomes should be consistence when the instrument is used at different times. Therefore in order to determine the consistency of the measuring instrument to return the same measurement when used at different times, the researcher used the split half method to determine reliability of the instrument. This would happen during the pilot study, before the actual research is done. The questionnaire items were assigned arbitrary scores. The scores that were obtained were used in Spearman rank correlation coefficient, of which if a correlation coefficient of 0.6 was obtained then it was considered reliable and suitable for data collection. Mbwesa (2006).

3.6. Data Collection Procedure

The researcher obtained an introductory letter from the University of Nairobi that was used to apply a research permit from the National Council of Science and Technology and Innovation (NACOSTI), and then proceed to the study area for appointments with farmers and agricultural officers for data collection. A covering letter was attached to the questionnaire to request the respondents to participate in the study. The agricultural officers will be informed beforehand about the purpose of the study.

3.7. Data Analysis Techniques

The study would use descriptive statistical methods in order to analyze the data collected. There was cross checking of the questionnaires to ensure that the questions are answered properly. The data was first divided into themes and sub themes before being analyzed. Frequency and percentages were used in the analysis and presented in a tabular form to enhance interpretation of data. The frequencies and percentages were then used to determine the factors influencing farm inputs on maize production.

3.8. Ethical Considerations

The researcher assured the respondents of the confidentiality of the information provided, including their own personal information. This was by informing the respondents of the purpose of the study as for academic purposes only.

3.9. Operational definitions of variables

This section shows the objectives of the study, dependent variable and indicators and the indicators of the independent variables and how they could be measured.

Table 3.1: Operational Definition of Variables

Objective	Variables	Indicators	Measurement
The influence of use of fertilizer on maize production in Kiminini sub-county	**Independent variable** -use of fertilizer **Dependent variable** -maize production	Rate of application type of fertilizer price of fertilizer	Nominal ordinary interval
The influence of technology on maize production in Kiminini sub-county	**Independent variable** - Application of technology **Dependent variable** -Maize production	Equipment use machine use seed orientation	Nominal ordinary Interval
To determine how use of herbicides influence maize production of farmers in Kiminini sub-county	Independent variable -use of herbicides Dependent variable -maize production	Level of access to information level of technology adoption	Nominal ordinary interval
To examine use of certified seeds influence on maize production in Kiminini sub-county	Independent variable -use of certified seeds Dependent variable -maize production	Level of acquisition of farm inputs level of productivity	Nominal ordinary Interval

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter discussed the questionnaire return rate, background characteristics of respondents, influence of fertilizer certified seeds, herbicides and technology on maize production.

4.2 Response Rate

409, (100%) questionnaires were given out to the respondents in the research area to fill. Of these questionnaires, 393(96.01%) were returned for analysis. However, 103 (26.01 %) questionnaires were incomplete and could not be analyzed. The remaining 280 questionnaires account for 70.01% response rate. According to Mugenda and Mugenda (2003), a response rate of 70% and above is sufficient and therefore it allowed the researcher to continue with data analysis.

4.3 Background characteristics of farmers

4.3.1 Gender of farmers

The farmers were asked to indicate their gender on the questionnaire. This was important, as it would help to determine the number of women that owned farms and therefore practiced farming of maize.

Table 4.1: Gender of farmers

DESCRIPTION	FREQUENCY	PERCENTAGE
Female	97	42.86
Male	183	57.14
TOTAL	**280**	**100**

The results of data analysis showed that 183(57.14%) of the respondents were male while 97(42.86%) of the respondents were female. This showed that more men were into maize production as opposed to the women. This was also an indicator that men had more land ownership rights than women. Those that answered the questionnaires may have answered by virtue that they stayed on the farm while the husbands worked formally in other urban places, and not that they necessarily owned the farms.

4.3.2 Age brackets of farmers

The researcher wanted to find out the age of the farmers to determine the young people who had taken up agriculture. This is due to the cross cutting issues of lack of formal jobs hence, the young people taking up farming as careers. This would also help to determine if the farmers were already set in maize production practices or if they could easily learn new ways of farming for improved yields.

Table 4.2: Age brackets of farmers

DESCRIPTION	FREQUENCY	PERCENTAGE
18-28 years	51	19.30
29-39 years	79	28.21
40-50years	83	29.64
Above 50 years	67	22.85
Total	**280**	**100**

The results of data analysis showed that 51(19.3%) of the respondents were young between the ages of 18 and 28 years old. While 79(28.21%) were between 29 and 39 years of age. On the other hand the majority of the respondents, 83 (29.64%) were between 40 and 50 years old. Those above 50 years were 67(22.85). The knowledge of age brackets of farmers was important as it helped in making inferences on maize production. Hence, this implied that

many young people were taking up agriculture as an income generating activity as opposed to looking for the scarce white-collar jobs. The other implication is that the farmers were more likely to get information on maize production from other sources such as the internet and field days as opposed to having the extension workers come for a visit to help with maize production. On the other hand, the farmers of between forty years and over already had a set mind into maize production and may not be easy to adapt to new ways.

4.3.3 Level of education of farmers

Level of education was important to determine the literacy levels of the farmers. This was important as it helped to determine whether they would fill the questionnaires with ease or they would need help. This was important if the researcher was to get valid results from the study.

Table 4.3: Level of education of farmers

DESCRIPTION	FREQUENCY	PERCENTAGE
Primary	68	24.29
Secondary	113	40.36
Tertiary	99	35.35
Total	**280**	**100**

On the level of education of farmers, the results of data analysis showed that; most of the farmers had reached secondary school 113(40.36%), with 99(35.35%) having attained a tertiary level of education. 68(24.29%) had attained primary level of education. The results implied that most of the farmers were literate and could therefore; conceptualize whatever knowledge the y got from any source on maize production though with varied degrees.

4.3.4 Employment status of farmers

Forms of employment help in earning an income. Hence, the researcher needed to determine the employment status and the ability of the farmers to afford the farm inputs for maize production.

Table 4.4: Employment status of farmers

DESCRIPTION	FREQUENCY	PERCENTAGE
Informal employment	183	65.36
Formal employment	97	34.64
Total	**280**	**100**

On the employment status of the farmers, 183(65.36%) were in informal employment while 97(34.64%) were in formal employment. This implied that most farmers did not have a steady income, and hence may have found it difficult to afford all the requirements for maize production. However, for those in formal employment, despite the regular income, other factors may have also come into play in affording all the inputs of maize production.

4.3.5 Number of years in maize farming

This was important to determine whether the farmers had experience in maize farming and of how many years. It was also important to help determine how the factors of maize production had affected the farmers over the years.

Table 4.5: Number of years in maize farming

Number of years	FREQUENCY	PERCENTAGE
Below 10 years	121	43.21
Above 10 years	159	56.79
Total	**280**	**100**

121 (43.21%) of the farmers had been in maize production for less than ten years while 159(56.79%) had been in maize farming for more than ten years. This implied that, those who had been in maize production for less than 10 years were more likely to embrace new methods of maize production leading to higher yields than those who had done maize production for over ten years. This is because, they were more likely used to the old methods and change would not be easy to them.

4.3.6 Acreage under maize production

The researcher wanted to find out the acreage under maize production. This helped the researcher to further find out if they had reduced the acreage and if they had reduced the acreage or not over the years. The researcher focused on the inputs as the major contributors to the reduced acreage.

Table 4.6: Acreage under maize production

Acreage under maize	FREQUENCY	PERCENTAGE
Below 10 acres	201	71.79
Above 10 acres	79	28.21
Total	**280**	**100**

On the acreages under maize production, 201(71.79%) produced maize on less than ten acres while 79((28.21%) produced maize on more than ten acres. This implied that very few farmers could afford maize production on much acreage. It also pointed towards the drop in maize production in the entire Trans Nzoia County and the ultimate food insecurity.

4.3.7 Reduction in acreage under maize.

Table 4.7: Reduction in acreage under maize.

	Yes		No		Total	
	F	%	F	%	F	P
Have you reduced the acreage for maize production	171	61.07	109	38.93	280	100

On being asked if the farmers had ever reduced the acreage for maize production, 171(61.07%) agreed to have reduced the acreage with 109(38.93%) saying no. to further find out why the farmers had considered the reduction in acreage, the following were the major reasons for the reduction.

Below are the major reasons why the farmers reduced the maize acreage.

Table 4.8: Reasons for acreage reduction

Reason	FREQUENCY	PERCENTAGE
It was too expensive	59	34.50
The need for diversification	25	14.62
Low yields	69	40.35
Others	18	10.52
Total	**171**	**100**

The major reason for the reduction of acreage for maize production was; the yields were low. This is as shown by 69(40.35%). The second reason was that it was too expensive .59(34.5%). This implied that maize production is expensive yet the yields are too low for the inputs. Hence, the reason for the reduction of acreage under maize production, by the farmers. These two reasons therefore influenced the farmers to diversify as shown by 25(14.62%) of the respondents. The other reason given included the need to sell some land, to give part of the land as inheritance and grazing fields for the dairy animals.

4.4 Influence of Fertilizer use on maize production

Fertilizer is an important input in maize production. Hence, the researcher needed to find how accessibility of fertilizer influenced maize production.

4.4.1 Access to fertilizer from the county government at low prices

The researcher sought to find out if the farmers received fertilizers from the county government at low prices. Below are the results of data analysis.

Table 4.9: Access to fertilizer from the county government at low prices

	Yes		No		Total	
	F	%	F	%	F	P
Do you access fertilizer from the county at lower prices	232	82.86	48	17.14	280	100

Some farmers agreed to receiving fertilizer from the county government. This was shown by 232, (82.86%) who agreed. On the other hand, 48 (17.14%) disagreed to receiving fertilizer from the county government. This implied that, the fertilizer was only available to a few farmers as opposed to all the farmers in Kiminini Sub County. It also implied that the national government did not play a role in ensuring that fertilizer is availed to the farmers for maize production. This is despite Trans Nzoia being known as the breadbasket of the country and beyond.

4.4.2 Availability of soil testing facilities

Soil testing determines the type of fertilizer for use in maize production. Hence, the researcher sought to find out if soil-testing facilities were available at the county or national government. Below are the results of data analysis.

Table 4.10: Availability of soil testing facilities

	Yes		No		Total	
	F	%	F	%	F	P
Do you use soil-testing facilities to determine the type of fertilizers needed on your farm?	17	7.07	263	93.93	280	100

On soil testing, 263(93.93%) of the farmers did not use soil testing facilities. Only 17(7.07%) agreed to the use of soil testing facilities. This implied that the soil testing facilities were not readily available to the farmers in Kiminini Sub County. It also implied that, the farmers were also not aware of the importance of soil testing for ensured productivity. This is because; the results from the test will ensure that only compatible fertilizers used for the soil type in maize production.

Table 4.11: Influence of Fertilizer use on maize production

The researcher formulated questions that answered the question of how use of fertilizer influenced maize production. Below are the results of data analysis.

STATEMENTS		SA	A	UD	D	SD	TOTAL
I use commercial fertilizers on my farm all the time in the production of maize	**F**	143	27	00	23	87	280
	%	51.07	09.64	00	08.21	31.07	100
The fertilizers that I use are adequate for the acreage of maize	**F**	84	37	09	41	109	280
	%	30.00	13.21	3.21	14.64	38.93	100
The use of fertilizers increase the maize production on the farms	**F**	161	39	07	10	63	280
	%	57.50	13.93	2.50	3.57	22.50	100
Soil testing is done before application of fertilizers	**F**	47	19	00	23	191	280
	%	16.79	06.79	00	08.21	68.21	100
Extension officers help with these services at all times	**F**	56	20	00	87	117	280
	%	20.00	07.14	00	31.07	41.79	100
The prices of fertilizer fluctuate a lot	**F**	128	56	03	40	53	280
	%	5.71	20.00	01.07	14.29	18.93	100
I follow all the instructions on the use of fertilizer	**F**	51	45	06	65	113	280
	%	18.21	16.07	02.14	23.21	40.36	100

On the influence of fertilizer on maize production, the farmers were asked if they used fertilizer all the time on their farms. The results of data analysis showed that, 143(51.07%) of the farmers strongly agreed to using commercial fertilizers for maize production while 27(9.64%) of the farmers agreed to the same. On the other hand, 87(31.07%) of the farmers strongly disagreed to using commercial fertilizers while 23(8.21%) of the farmers disagreed. These results implied that, as much as most farmers used commercial fertilizer, others did not use it. Hence, they may have used organic fertilizers such as animal manure and composted plant wastes.

On whether the fertilizer used was adequate for the acreage of land, 109(38.93%) of the farmers strongly disagreed, with 41(14.64%) disagreeing. On the other hand, 84(30%) of the farmers strongly agreed that the fertilizer was adequate with 37(13.21%) agreeing. A small number of farmers 09(3.21%) however were undecided on whether the fertilizer was enough. This implied that, most farmers did not use adequate fertilizer for the acreage of land and this may have affected the maize production. It also implied that, since some farmers were undecided, they really did not understand the requirements for fertilizer use in maize production and may have over used or underused the fertilizer leading to low maize production. These findings concur with those of (Crawford et al., 2008) who found out that Europe and Americas growth rates in fertilizer consumption are particularly high, in part because the real price of fertilizer is higher in Africa than in many other regions. Hence, due to the high prices in Africa, affordability of the fertilizer is low leading to the low consumption. This also explains why most farmers mainly depend on organic nutrient resources to sustain crop productivity. This is as shown in the studies by (Mapfumo and Giller, 2001; Mtambanengwe and Mapfumo, 2005) who observed that most farmers in Africa used little inorganic fertilizers. However, the impact of organic nutrient resources is often

low due to inadequate amounts available and poor quality of the organic materials (Murwira and Palm, 1999). This often times leads to low maize production.

The farmers also agreed that the use of fertilizer increased maize production on their farms. This was as shown by 161(57.50%) who strongly agreed. This was also seen by 39(13.93%) who agreed to the increase in maize production. On the other hand however, 63(22.50%) and 10(3.57%) disagreed strongly and disagreed respectively. This implied that, the farmers who used fertilizers experienced increased production while those who used the wrong fertilizers or inadequate fertilizers did not experience increased production on their farms. These findings agree with those of (Sanchez et al., 1997). In their study, they found out that fertilizer use has been responsible for a large part of sustained crop productivity worldwide. Hence, this is true even for the farmers of Kiminini Sub County.

It also showed that both organic and in organic fertilizers contributed to the increase in maize production as long as the quantities were adequate. On the other hand, it also implied that fertilizer was not the only factor that influenced maize production. When asked on the prices of fertilizers, 128(45.71%) and 56(20.00%) agreed strongly and agreed respectively that the prices of fertilizers fluctuated a lot. However, 53(18.93%) and 40(14.29%) disagreed strongly and disagreed respectively. These findings also agree with other scholars who found out that Africa contains 25 percent of the world's arable land, yet represents less than 1 percent of global fertilizer consumption (Kariuki, 2011). As of 2010, fertilizer use in Ghana was well below the average in SSA at less than 6 kg/Ha (FAOstat, 2014). The fluctuating prices made it impossible for the farmers to use the required amounts of fertilizer. This contributed to the low maize yields.

The implication was that, whereas some farmers planned and prepared in advance, others did not. Those who planned and prepared most probably bought the fertilizers when the demand was low during the dry seasons and hence the prices were low. While the other group of

farmers bought during the rainy season when the demand was high and the prices were high. Nevertheless, there was fluctuation of prices, which may have also hindered the farmers from adequately budgeting for the fertilizers hence affecting maize production.

On whether the farmers followed instructions on the use of fertilizer, 113(40.36%) of the farmers strongly disagreed with 65(23.21%) disagreeing. This implied that, the farmers had their own beliefs about use of fertilizer and did not therefore need to follow the instructions. It also implied that there were no instructions to be followed and hence, it was a trial and error exercise. This is further strengthened by the 06(2.14%) of the farmers who were undecided. However, 51(18.21%) and 45(16.07%) of the farmers agreed strongly and agreed respectively. This implied that, these farmers were probably new in maize production and used all the available resources to ensure productive maize production. Hence, these were likely to be the young farmers who had ventured into maize production. These findings can be complemented with those of Kolawole (2014). He found out that the period of fertilizer application also affect the crop production and the most critical period for fertilizer application is flowering approach (15-20 days before and after). As a result, due to the frequent price fluctuations, some farmers may have used fertilizer at the wrong times, therefore affecting the overall maize production for farmers.

4.5 Influence of using certified seeds on maize production

4.5.1 Access to certified maize seeds from the government

The researcher sought to determine how access to certified seeds from the county and national governments influenced maize production. Below are the results of data analysis.

Table 4.12: Access to certified maize seeds from the government

	Yes		No		Total	
	F	%	F	%	F	P
Do you access certified seed maize from the government on time?	143	51.07	137	48.93	280	100

The farmers were asked to indicate if they accessed maize seeds on time from the government. The results of data analysis showed that, 143(51.07%) of the farmers agreed while 137(48.93% of the farmers did not. This implied that, the governments were selective in availing certified seeds to the farmers in Kiminini Sub County for maize production.

4.5.2 The influence of using certified seeds on maize production

The researcher formulated statements that helped to answer the question of how the use of certified seeds influenced maize production. Below are the results of data analysis.

Table 4.13: The influence of using certified seeds on maize production

STATEMENTS		SA	A	UD	D	SD	TOTAL
I understand the meaning of certified seeds	**F**	85	31	11	54	99	280
	%	30.36	11.07	3.93	19.29	35.36	100
I use certified seeds for my farm all the time	**F**	122	75	04	39	40	280
	%	43.57	26.78	01.43	13.93	14.29	100
Certified maize seed is affordable	**F**	65	35	10	77	93	280
	%	23.21	12.50	03.57	27.50	33.21	100
Certified seed is readily available	**F**	101	59	9	43	68	280
	%	36.07	21.07	03.21	15.36	24.29	100
The certified seed is the recommended seed for my soil type	**F**	53	24	151	49	03	280
	%	18.93	08.57	53.93	17.50	1.07	100
Prices of seed fluctuate a lot	**F**	98	74	08	49	51	280
	%	35.00	23.43	2.86	17.50	18.21	100

On whether the farmers understood the meaning of certified seeds, 85(30.36%) strongly agreed while 31(11.07%) agreed. This implied that these farmers were getting the right seed for their soil types and consequently they had good yields. A further 11(3.93%) of the respondents were undecided. These farmers are those that just planted seed maize for sake of planting without knowing their characteristics. This could have led to low maize production. This is also true for the 99(35.36%) and 54(19.29%) of the farmers who strongly disagreed and disagreed consecutively. Planting the wrong seed type for the oil type or the season leads to low maize production**.** These findings concur with those of Duflo et al. 2008). In his study, he concluded that despite trials by researchers to get the best seeds, adoption rates of improved maize varieties and fertilizers remain low. He further pointed out that this is in sharp contrast to other countries such as the United States that have fully adopted high yielding varieties (HYV), (Dorman 1996).

The farmers were also asked to indicate if they used certified seeds on their farms all the time. The results of data analysis showed that; 122 (43.57%) strongly agreed with 75 (26.78%) agreeing to the same. The other famers, 39(13.93%) disagreed with 40(14.29%) strongly disagreeing. A small number of farmers were also unsure as shown by 04(1.43%). This implied that those farmers who understood the meaning of certified seeds all the time while those who did not understand the meaning of certified seeds did not use the seeds. This ultimately led to a decrease in maize production.

The farmers were also requested to react on the affordability of certified seed maize. The results of data analysis showed that, 65(23.21%) of the respondents strongly agreed that it was affordable with 35(12.5%) agreeing consecutively. A further 77(27.50%) disagreed with 93(33.21%) strongly disagreeing. This implied that most farmers could not afford the certified maize seed and therefore used any maize that was said to be seed. This could have led to the reduction in the maize production. Other farmers were also undecided as shown by

10(3.57%) of the respondents. This also implied a lack of record keeping determining the prices and if indeed the yields were high, hence making it affordable or not. This is because; high yields make the seed to be affordable as the farmers can afford to buy seed for the next crop.

The availability of certified seed was another issue that was investigated. Under this, the farmers were to show if the certified seeds were readily available or not. The results of data analysis showed that, 101(36.97%) of the farmers strongly agreed to the availability of certified seeds with 59(21.09%) agreeing. This implied that the seeds were readily available and the farmers just needed to know which seed to use. On the other hand, 68(24.29%) strongly disagreed to its availability with 43(15.36%) disagreeing. This also implied that the seed was not readily available to all the farmers and therefore some farmers opted for other options of seed maize that were not certified. These may have led to the reduced production of maize.

On whether the certified seed was the recommended for the soil type, 151(53.93%) were undecided. Only 53(18.93%) strongly agreed while 24(8.57%) agreed. 49(17.50%) disagreed with 3(1.07%) strongly disagreeing. This showed that, despite the farmers using certified seed on their farms, they were not sure whether it was the recommended seed for their soil type. This may be due to the unavailability of the knowledge of soil testing facilities within Trans-Nzoia County. Consequently, this may be the biggest reason for the reduced maize production in Kiminini Sub County.

On the prices of the certified seeds, the farmers had the following to say; 98(35%) strongly agreed that the prices fluctuated a lot, 74(23.43%) agreed to the same while 8(2.86%) were undecided. On the other hand, 51(18.21%) of the farmers disagreed strongly with 49(17.50%) disagreeing. This implied that mainly, the prices of maize fluctuated. However, the fluctuations were dependent on other factors such as nearness to the seed factory and the road

network. This is because, the dealers increased prices to cover their costs and make a profit. In some cases, the prices may have been exaggerated depending on the demand and supply factors of the certified seeds.

4.6 Influence of use of herbicides on maize production

4.6.1 Access of herbicides from the government

The researcher sought to determine how access to herbicides from the county and national governments influenced maize production. Below are the results of data analysis.

Table 4.14: Access of herbicides from the government

	Yes		**No**		**Total**	
	F	**%**	**F**	**%**	**F**	**P**
Do you access herbicides from the government at subsidized prices?	43	15.36	237	84.64	**280**	**100**

The farmers were asked to answer whether they received herbicide from the government at subsidized prices and they gave the following answers; 237(84.64%) disagreed with 43(15.36%) of the respondents agreeing. This showed that the government did availed the herbicides to a few farmers who could not make an impact in the overall maize production. It also implies that the farmers lack information on the availability of such services.

4.6.2 The influence of use of herbicides on maize production

The researcher formulated statements that helped to answer the question of how the use of herbicides influenced maize production. Below are the results of data analysis.

Table 4.15: The influence of use of herbicides on maize production

STATEMENTS		SA	A	UD	D	SD	TOTAL
I understand what herbicides are	**F**	34	26	7	54	159	280
	%	12.14	14.44	2.50	19.29	56.77	100
I use herbicides on my farm all the time	**F**	09	23	00	83	165	280
	%	3.21	8.21	00	29.64	58.93	100
Herbicides are affordable	**F**	09	15	5	68	183	280
	%	3.21	5.36	1.79	24.29	65.36	100
I know the right herbicides to use	**F**	09	13	7	68	183	280
	%	3.1	4.64	2.50	24.29	65.36	100

From the results of data analysis, 159(56.77%) of the farmers strongly disagreed that they did not understand what herbicides were. A further 54(19.29%) disagreed with the same. Only 34(12.14%) of the farmers strongly agreed that they knew what herbicides were, with 26(14.44%) agreeing. This implied that most farmers did not have knowledge of herbicides and therefore it was impossible for the farmers to use them in maize production. This further implied that the farmers struggled with manual weeding leading to improper management of weed and low maize production.

However, on whether the farmers used the herbicides on their farms for maize production at all times, the farmers responded by strongly disagreeing as shown by 165(58.93%) and 83(29.64%) who disagreed respectively. However, a small number of farmers strongly agreed to use the herbicides on their farms for maize production at all times. This is as shown by 09(3.21%). 23(8.21%) on the other hand agreed to the same. This implied that there were factors that made the farmers not to use herbicides for weed control. This is best answered by the next statement where farmers were asked whether herbicides were affordable. The results of data analysis showed that only those farmers who used it agreed that herbicides were affordable with the rest being undecided and disagreeing respectively. This implied that the prices of the herbicides were the major reasons why many farmers did not use the herbicides for maize production. Another major factor could be the availability of water for mixing the

chemicals. Farmers who lived farther away from major sources may find it had to use herbicides just as those with large farms without adequate mechanization.

Farmers were asked to say if they knew the right herbicide to use. The results of data analysis showed that, only those who used the herbicides knew the right herbicides to use since they used the herbicides all the time. For those who did not use the herbicide, they had no idea which herbicide to use, since they did not use on their farms.

4.7 Influence of adoption of technology influences maize production

4.7.1 Adoption of irrigation technology for maize production

Irrigation is a maize production technology that if adopted, can help improve maize production and food security as a whole. Hence, the researcher sought to find if the farmers had adopted irrigation technology or still depended on rain fed agriculture. Below are the results of data analysis.

Table 4.16: Adoption of irrigation technology for maize production

	Yes		**No**		**Total**	
	F	%	F	%	F	%
Do you use irrigation for maize production on your farm?	33	11.79	247	88.21	280	100

The results of data analysis showed that, 247(88.21%) of the farmers did not practice irrigation on their farms. Only 33(11.79%) of the farmers had adopted this technology and hence use it on their farms. These findings are slightly different from those of Simiyu (2013) who found out that only 36.63% of the farmers used irrigation on their farms at times while 63.37% did not, This implied that, the farmers still depended on the rains for maize production. However, global warming has come with climatic changes that make it difficult to have unpredictable rain patterns to sustain rain fed agriculture. This is therefore a pointer

towards the low maize production as farmers only planted one season when they could adopt technology and have two seasons of maize production.

4.7.2 Influence of adoption of technology on maize production

The researcher also formulated statements that tried to answer the research question on how the adoption of technology by the farmers influenced maize production. Below are the results of data analysis.

Table 4.17: Influence of adoption of technology on maize production

Statements		SA	A	UD	D	SD	TOTAL
Extension officers are around to advice farmers on the new technologies in maize production	**F**	21	07	04	74	174	280
	%	7.5	2.5	1.43	26.43	62.14	100
I have learned of new maize farming technologies from other sources	**F**	68	31	5	81	95	280
	%	24.29	11.07	1.79	28.93	33.93	100
I have adopted the new technologies	**F**	48	19	11	74	128	280
	%	17.14	6.79	3.93	26.43	45.71	100
The new technologies help to increase the maize yields	**F**	39	29	10	94	108	280
	%	13.93	10.36	3.57	33.57	38.57	100

The farmers were asked if extension officers were around to give advice to the farmers on new technologies in maize production, the farmers had the following to say; 21(7.5%) of the farmers strongly agreed, 07(2.5%) agreed to the availability of extension officers. This is in contrast to 174 (62.14%) and 74(26.43%) who strongly disagreed and disagreed respectively. This implied that the farmers lacked information on new technologies and hence, it was so difficult for them to adopt the technologies for improved maize production.

Some farmers agreed to having learnt of new maize production technologies from other sources. This was shown by 68(24.29%) of the farmers who strongly agreed and 31(11.07%) of the farmers who also agreed to the same. A larger number of farmers still disagreed. This

is shown by 81(28.93%) and 95(33.93%) who disagreed and strongly disagreed respectively. This implied that the farmers were eager to improve their maize production. In the absence of officers to help them, they sought the knowledge from other sources such as the internet, other farmers and any place where they could get information. However, some farmers needed practical demonstrations to understand all the information and use it for their benefit.

Of the farmers who sought information elsewhere, 48(17.14%) strongly agreed to adopt the new technologies with 19(6.79%) agreeing to the same. This implied that technology in itself was expensive, hence not all the farmers could adopt. It could also imply that the farmers developed a wait and see attitude, to see the benefits from the farmers who had adopted the new technologies.

Of those who had adopted the new technologies learnt, 39(13.03%) strongly agreed that there was an increase in the yields of maize. A further 29(10.36%) agreed to the same. This implied that technology if well availed to the farmers can promote improved productivity amongst the maize farmers. Despite these findings, the overall conclusion was that the farmers had not adopted technology on their farms. This is in agreement with the findings of V. N. Ozowa, (1995),

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

This is the final chapter of the study and it summarizes all the findings of the study. It also gives the conclusions, recommendations, contribution to the body of knowledge and suggested areas for further research.

5.2 Summary of findings

Based on the information obtained from data analyzed to answer the research questions of the study, a number of findings were presented in chapter four. The findings are summarized in this chapter by the researcher, where he also gives conclusions and recommendations. Contributions to the body of knowledge are also highlighted and areas of further researcher suggested by the researcher.

5.2.1 Background characteristics of farmers

The results of data analysis showed that 183(57.14%) of the respondents were male while 97(42.86%) of the respondents were female. This showed that more men were into maize production as opposed to the women. This was also an indicator that men had more land ownership rights than women. Those that answered the questionnaires may have answered by virtue that they stayed on the farm while the husbands worked formally in other urban places, and not that they necessarily owned the farms.

The results of data analysis also showed that 51(19.3%) of the respondents were young between the ages of 18 and 28 years old. While 79(28.21%) were between 29 and 39 years of age. On the other hand the majority of the respondents, 83(29.64%) were between 40 and 50 years old. Those above 50 years were 67(22.85). The knowledge of age brackets of farmers was important as it helped in making inferences on maize production. Hence, this showed that many young people were taking up agriculture as an income generating activity as

opposed to looking for the scarce white-collar jobs. On the other hand, the farmers of between forty years and over already had a set mind into maize production and may not be easy to adapt to new ways.

On the level of education of farmers, the findings showed that; most of the farmers had reached secondary school 113(40.36%), with 99(35.35%) having attained a tertiary level of education. 68(24.29%) had attained primary level of education. The findings therefore showed an average literacy level of the farmers.

183(65.36%) were in informal employment while 97(34.64%) were in formal employment. This showed that most of the farmers had low socioeconomic status. This affected maize production as the inputs for maize production required a steady source of income. The findings also indicated that 121 (43.21%) of the farmers had been in maize production for less than ten years while 159(56.79%) had been in maize farming for more than ten years. On the acreages under maize production, 201(71.79%) produced maize on less than ten acres while 79((28.21%) produced maize on more than ten acres.

On being asked if the farmers had ever reduced the acreage for maize production, 171(61.07%) agreed to have reduced the acreage with 109(38.93%) saying no. The major reason for the reduction of acreage for maize production was; the yields were low. This is as shown by 69(40.35%). The second reason was that it was too expensive as shown by 59(34.5%). This implied that maize production is expensive yet the yields are too low for the inputs. These two reasons therefore influenced the farmers to diversify as shown by 25(14.62%) of the respondents. The other reason given included the need to sell some land, to give part of the land as inheritance and grazing fields for the dairy animals.

5.2.2 Influence of Fertilizer use on maize production

Some farmers agreed to receiving fertilizer from the county government. This was shown by 263, (82.86%) who disagreed. On the other hand, 17(7.07%) agreed to receiving fertilizer from the county government. On soil testing, 263(93.93%) of the farmers did not use soil testing facilities. Only 17(7.07%) agreed to the use of soil testing facilities. The results of data analysis showed that, 143(51.07%) of the farmers strongly agreed to using commercial fertilizers for maize production while 27(9.64%) of the farmers agreed to the same. On the other hand, 87(31.07%) of the farmers strongly disagreed to using commercial fertilizers while 23(8.21%) of the farmers disagreed. Hence, they may have used organic fertilizers such as animal manure and composted plant wastes.

On whether the fertilizer used was adequate for the acreage of land, 109(38.93%) of the farmers strongly disagreed, with 41(14.64%) disagreeing. On the other hand, 84(30%) of the farmers strongly agreed that the fertilizer was adequate with 37(13.21%) agreeing. A small number of farmers 09(3.21%) however were undecided on whether the fertilizer was enough. The farmers also agreed that the use of fertilizer increased maize production on their farms. This was as shown by 161(57.50%) who strongly agreed. This was also seen by 39(13.93%) who agreed to the increase in maize production. On the other hand however, 63(22.50%) and 10(3.57%) disagreed strongly and disagreed respectively.

It also showed that both organic and in organic fertilizers contributed to the increase in maize production as long as the quantities were adequate. When asked on the prices of fertilizers, 128(45.71%) and 56(20.00%) agreed strongly and agreed respectively that the prices of fertilizers fluctuated a lot. However, 53(18.93%) and 40(14.29%) disagreed strongly and disagreed respectively.

On whether the farmers followed instructions on the use of fertilizer, 113(40.36%) of the farmers strongly disagreed with 65(23.21%) disagreeing. This is further strengthened by the

06(2.14%) of the farmers who were undecided. However, 51(18.21%) and 45(16.07%) of the farmers agreed strongly and agreed respectively.

5.2.3 Influence of using certified seeds on maize production

The results of data analysis showed that, 143(51.07%) of the farmers agreed while 137(48.93% of the farmers did not agree on receiving certified seeds from the county government. On whether the farmers understood the meaning of certified seeds, 85(30.36%) strongly agreed while 31(11.07%) agreed. A further 11(3.93%) of the respondents were undecided.

These farmers are those that just planted seed maize for sake of planting without knowing their characteristics. This could have led to low maize production. This is also true for the 99(35.36%) and 54(19.29%) of the farmers who strongly disagreed and disagreed consecutively. Planting the wrong seed type for the soil type or the season leads to low maize production**.**

The farmers were also asked to indicate if they used certified seeds on their farms all the time and 97(34.64%) strongly agreed with 31(11.07%) agreeing to the same. The other famers, 39(13.93%) disagreed with 40(14.29%) strongly disagreeing. A small number of farmers were also unsure as shown by 04(1.43%). The farmers were also requested to react on the affordability of certified seed maize and 65(23.21%) of the respondents strongly agreed that it was affordable with 35(12.5%) agreeing consecutively. A further 77(27.50%) disagreed with 93(33.21%) strongly disagreeing. Other farmers were also undecided as shown by 10(3.57%) of the respondents. The availability of certified seed was another issue that was investigated. Under this, the farmers were to show if the certified seeds were readily available or not and 101(36.97%) of the farmers strongly agreed to the availability of certified seeds with 59(21.09%) agreeing. On the other hand, 68(24.29%) strongly disagreed to its availability with 43(15.36%) disagreeing.

On whether the certified seeds were recommended for the soil type, 151(53.93%) were undecided. Only 53(18.93%) strongly agreed while 24(8.57%) agreed. 49(17.50%) disagreed with 03(1.07%) strongly disagreeing. On the prices of the certified seeds, 98(35%) strongly agreed that the prices fluctuated a lot, 74(23.43%) agreed to the same while 8(2.86%) were undecided. On the other hand, 51(18.21%) of the farmers disagreed strongly with 49(17.50%) disagreeing.

5.2.4 Influence of use of herbicides on maize production

The farmers were asked to answer whether they received herbicide from the government at subsidized prices and 237(84.64%) disagreed with 43(15.36%) of the respondents agreeing. Findings also showed that, 159(56.77%) of the farmers strongly disagreed that they did not understand what herbicides were. A further 54(19.29%) disagreed with the same. Only 34(12.14%) of the farmers strongly agreed that they knew what herbicides were, with 26(14.44%) agreeing.

However, on whether the farmers used the herbicides on their farms for maize production at all times, the farmers responded by strongly disagreeing as shown by 165(58.93%) and 83(29.64%) who disagreed respectively. A small number of farmers strongly agreed to use the herbicides on their farms for maize production at all times. This is as shown by 09(3.21%). 23(8.21%) on the other hand agreed to the same. Findings also showed that, only those who used the herbicides knew the right herbicides to use since they used the herbicides all the time. For those who did not use the herbicide, they had no idea which herbicide to use, since they did not use on their farms.

5.2.5 Influence of adoption of technology influences maize production

The results of data analysis showed that, 247(88.21%) of the farmers did not practice irrigation on their farms. Only 33(11.79%) of the farmers had adopted this technology and hence use it on their farms.

The farmers were asked if extension officers were around to give advice to the farmers on new technologies in maize production, and the findings showed that 21(7.5%) of the farmers strongly agreed, 07(2.5%) agreed to the availability of extension officers. This is in contrast to 174(62.14%) and 74(26.43%) who strongly disagreed and disagreed respectively. Some farmers agreed to having learnt of new maize production technologies from other sources. This was shown by 68(24.29%) of the farmers who strongly agreed and 31(11.07%) of the farmers who also agreed to the same. A larger number of farmers still disagreed. This is shown by 81(28.93%) and 95(33.93%) who disagreed and strongly disagreed respectively. Of the farmers who sought information elsewhere, 48(17.14%) strongly agreed to adopt the new technologies with 19(6.79%) agreeing to the same. Of those who had adopted the new technologies learnt, 39(13.03%) strongly agreed that there was an increase in the yields of maize. A further 29(10.36%) agreed to the same.

5.3 Conclusions of findings

Following the findings of this study, the researcher made the following conclusions.

Whereas fertilizer was given to the farmers by the county government, not all farmers get the fertilizer. Only 7% of the farmers received fertilizer and hence, this could not have an influence in maize production. Soils were not tested on most farms. Due to the length of time that farmers have used fertilizers unsupervised, as shown by the number of farmers who did not follow instructions on the use of fertilizers, it is probable that there are residues that over time have led to soil acidity. Acidic soils are unproductive and this could be the reason why maize production is low. Farmers who used little fertilizer may have also experience low yields leading to low maize productivity. This is as shown that proper use of fertilizers increased maize productivity. The fluctuations in fertilizer prices also contribute to poor planning leading to unplanned farming projects that tend to fail in most cases hence low productivity.

Not all farmers received certified seeds from the county government. Not using certified seeds contributes to low maize productivity. The lack of knowledge of certified seeds is the biggest causes to low maize productivity. A large number of farmers who did not use certified maize seed show this. However, this could be linked to their lack of knowledge on certified seeds or the price of the certified seeds fluctuated highly hence making it difficult for the farmers to use it all the time. The farmers used the wrong type of seeds for their soil type. This is due to the lack of soil testing facilities. All these factors therefore reduced maize productivity.

The knowledge of herbicides was almost nonexistent and therefore the farmers did not use them. Another reason was that, even those who used found the Use of herbicides to be beyond the reach of most farmers. No form of subsidy was availed to them in weed control using herbicides. Hence, the farmers resorted to manual weed control methods, which were slow leading to low productivity.

There were no extension officers to advise the farmers with new technology. Some farmers sought for knowledge on maize production technologies from other sources. However, not all farmers with the knowledge could implement them as they lacked the know how to do the same. This had an effect on maize production as those who managed to implement saw improvements in maize productivity.

5.4 Recommendations

Following the conclusions made by the researcher on this study, the researcher made the following recommendations, which he believes that if put in place could help to improve maize production.

On fertilizers, the researcher recommended that all the farmers be allowed access to soil testing facilities. This can be done through advocacy on the soil testing agencies within the county and the importance of doing the same. The farmers should also be advised on the

importance of using the right quality and quantity of fertilizer per acre for improved productivity. The prices of fertilizers should also be stabilized to allow for proper planning for the season of maize production.

Certified seeds should be availed to all farmers at a subsidized rate to avoid farmers using the wrong seed due to their fair prices. This would also help in proper planning, as the price fluctuations will be curbed. Advocacy should also carry out to help farmers understand the need of using certified seed at all times.

Farmers should be encouraged to use herbicides as they help in saving time and they are effective. If possible, these too should be supplied with the seed and fertilizer to ensure timely maize production leading to food security in Trans Nzoia and beyond.

The county government should employ extension officers to advise farmers on new technologies in maize production and to help the farmers adopt the technologies on a practical aspect. Advocacy is also necessary to help the farmers understand the importance of adopting new technologies for food security.

5.5 Contributions to the body of knowledge

5.6 Suggested areas of further research

The researcher suggested the following areas for further research.

1. The researcher suggested that a similar research be studied in other places where all these factors were available to see if the findings would be different in terms of production.
2. The researcher also suggested that a study on the influence of globalization on maize production should be carried out to see its effects on maize production.
3. A study on how the availability of factors of production affect maize production should also be carried out for comparison.

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APPENDICES

APPENDIX I: TRANSMITTAL LETTER

NELSON MAYEKU
PO BOX 156-30200
KITALE.
Mobile: 0724375708

10th June, 2017

THE
SECRETARY NATIONAL COUNCIL OF SCIENCE AND TECHNOLOGY (NCST)
PO BOX
NAIROBI.

THRO'
THE COURSE DIRECTOR,
KITALE EXTRA MURAL CENTER/UNIVERSITY OF NAIROBI

Dear Sir/Madam,

RE: REQUEST TO PARTICIPATE IN A RESEARCH PROCESS

I am a student at the University of Nairobi pursuing a Master of Arts degree in Project Planning and Management. I am undertaking a research titled the influence of farm inputs on maize production in Kiminini Sub -county, Trans-nzoia County, Kenya. I kindly request you to participate in this study and your responses to items in the questionnaire will be treated with uttermost confidentiality, and will not be used for any other purposes except for this study.

Yours faithfully,

Nelson Mayeku
L50/85026/2016

APPENDIX II: QUESTIONNAIRE TO THE FARMERS

Dear Respondent,

Questionnaire meant to explore the influence of farm inputs on maize production in Kiminini sub county, Trans Nzoia County**,** (Please note that the study is specifically for academic purposes, all the information given will be treated with due confidentiality).

PART A: SOCIAL – DEMOGRAPHIC DATA.

- Gender: Male ☐ Female ☐
- Age: 18-28 ☐ 29-39 ☐ 40-50 ☐ above 60 ☐
- Level of education : Primary ☐ Secondary ☐ Tertiary ☐
- Employment status: Informal employment ☐ Formal employment ☐

PART B: QUESTIONNAIRE 1 FOR FARMERS

How long have you been in farming industry	**YES**
	NO
What is the acreage under maize?	**YES**
	NO
Have you ever reduced or increased acreage for maize production?	**YES**
	NO
Do you use farm equipments and machines?	**YES**
	NO
Do you use irrigation for maize production?	**YES**
	NO
What is the source of your water for irrigation	**YES**
	NO
Which new technologies do you employ in crop farming	**YES**
	NO

PART C: QUESTIONNAIRRE 2 FOR FARMERS

In the following statements tick the appropriate answer to you, whereby:

STRONGLY DISAGREE, 2-DISAGREE, 3 UNDECIDED, 4-AGREE and 5 – STRONGLY AGREE

i. To determine the influence of Fertilizer use on maize production

Statement s	**SA**	**A**	**UD**	**D**	**SD**	**TOTAL**
I use fertilizers on my farm all the time in the production of maize						
The fertilizers that I use are adequate for the acreage of maize						
The use of fertilizers increases the maize production on the farms						
Extension officers help with these services at all times						
The prices of fertilizers fluctuate a lot						
I follow all the instructions on the use of fertilizer						
I use commercial fertilizers on my farm all the time in the production of maize						

ii. To evaluate the influence of using certified seeds on maize production

STATEMENTS	**SA**	**A**	**UD**	**D**	**SD**	**TOTAL**
I understand the meaning of certified seeds						
I use certified maize seeds for my farm all the time						
Certified maize seed is affordable						
Certified seeds is readily available						
The certified is recommended seed for my type of soil						
The prices if seeds fluctuate a lot						

iii. To evaluate the influence of use of herbicides on maize production

STATEMENTS	SA	A	UD	D	SD	TOTAL
I understand what herbicides are						
I use herbicides on my farm all the time						
Herbicides are affordable						
I know the right herbicides to use						

iv. To determine how adoption of technology influences maize production

STATEMENTS	SA	A	UD	D	SD	TOTAL
Extension officers are around to advise farmers on the new technologies In maize production						
Farmers have adopted the new technologies						
The new technologies help to increase the maize yields						

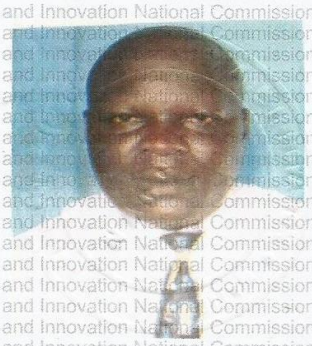
APPENDIX III: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MR. NELSON MAKOKHA MAYEKU
of UNIVERSITY OF NAIROBI, 4380-30200 KITALE,has been permitted to conduct research in *Transnzoia County*

on the topic: *THE INFLUENCE OF FARM INPUTS ON MAIZE PRODUCTION IN KIMININI SUB -COUNTY, TRANS NZOIA COUNTY, KENYA*

for the period ending:
18th July,2018

Permit No : NACOSTI/P/17/79342/18283
Date Of Issue : 18th July,2017
Fee Recieved :Ksh 1000



.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. **The License is valid for the proposed research, research site specified period.**
2. **Both the Licence and any rights thereunder are non-transferable.**
3. **Upon request of the Commission, the Licensee shall submit a progress report.**
4. **The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.**
5. **Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.**
6. **This Licence does not give authority to transfer research materials.**
7. **The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.**
8. **The Commission reserves the right to modify the conditions of this Licence including its cancellation without prior notice.**

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No.A 15024

CONDITIONS: see back page

APPENDIX IV: NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
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Email: dg@nacosti.go.ke
Website:www.nacosti.go.ke
Whenreplying pleasequote

9th Floor, Utalii House
Uhuru Highway
P.O.Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/79342/18283**

Date: **18th July, 2017**

Nelson Makokha Mayeku
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The influence of farm inputs on maize production in Kiminini Sub-County, Trans Nzoia County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Trans Nzoia County** for the period ending **18th July, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education,Trans Nzoia County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Trans Nzoia County.

The County Director of Education
Trans Nzoia County.