EFFECT OF FERTILIZER SUPPLY SUPPORT PROGRAMMES ON FARMERS' PARTICIPATION IN MAIZE PRODUCTION IN TRANS-NZOIA COUNTY, KENYA

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A Thesis Submitted to Graduate School in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Science in Agricultural Extension of Egerton University

EGERTON UNIVERSITY

SEPTEMBER 2014

DECLARATION AND RECOMMENDATION

Declaration

I hereby declare that this is my original work and has not been submitted or published for any award of a degree or diploma in this or any other university.

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Recommendation

This thesis has been submitted to Graduate School for examination with our approval as University supervisors.

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DEDICATION

This thesis is dedicated to my wife, Elizabeth, our children and my mum Seline who despite her advanced age kept on encouraging me to continue with my studies.

ACKNOWLEDGEMENT

I would like to take this opportunity to thank my employer the Ministry of Agriculture for granting me a two year study leave which made me complete my study without much interruption. Secondly I want to thank my supervisors; Professor C.A. Onyango and Dr. J Obara for their constant guidance, support and advice without which I could have not succeeded. It is also important to acknowledge the support from the staff both teaching and non teaching from the Faculty of Education and Community Studies of Egerton University who have been very supportive during this period. Lastly I would like to thank my family for their support and all the people who assisted me in one way or the other during my studies including the colleagues from the Ministry of Agriculture who assisted me in organizing farmers for data collection.

ABSTRACT

Agriculture is important for food security and poverty reduction. Achieving food security is still a challenge to some developed and most of the developing countries. Maize is the main staple that most people in Kenya still depend on. The production of maize has been in the decline over the years with an average annual production of 30 million bags (2.7 million metric tons) against an annual consumption of 42 million bags (3.78 million metric tons). The country on average suffers a maize deficit of about 10 million bags (900,000 metric tons) annually and occasionally imports maize. In Trans-Nzoia County which is the grain basket in the country and where maize is mainly grown as an income generating enterprise, the cost of production is high. This has been caused by the high cost of fertilizer which led to low achievements of acreages and yields under maize. The Kenya Government had put in place programmes to motivate maize farmers to improve maize production. These included the Fertilizer Subsidy Programme (FSP) and the National Accelerated Agricultural Input Access Programme (NAAIAP) which provided resource poor farmers with subsidized and free fertilizer respectively. Despite all these interventions, the maize deficit in the country is still very high. This made it necessary to find out on the effects of these interventions on maize production in Trans-Nzoia County and the challenges facing the implementation of these programmes**.** The main objective of this study was to investigate how these fertilizer supply support programmes benefited maize farmers in relation to increase in acreages, fertilizer use and yields in Trans-Nzoia County. The research design in this study was a cross sectional survey, where structured questionnaires were administered through interviews to collect data from 180 randomly selected farmers in all the three districts of Trans-Nzoia County. The data were analyzed using the Statistical Package for Social Sciences (SPSS). A reliability coefficient (Cronbach alpha) of 0.83 against a set Cronbach alpha of 0.70 and the null hypotheses were tested at 0.05 α confidence level of significance. The findings showed that in the two programmes, there was statistically significant difference between quantities of fertilizers acquired, acreages and yields achieved before and after fertilizer supply support programmes. The fertilizer use increased from 37 to 68 bags per farmer under the subsidy programme and from 2.2 to 4.3 bags under the NAAIAP programme. Under the FSP, the mean acreages increased from 14 to 18 per farmer and yields increased from 15 to 23 (90 kg) bags. This study recommends that the Government can continue with subsidy programmes because they lead to an increase in acreages, use of fertilizer and yields which may promote the agricultural growth.

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ABBREVATIONS AND ACRONYMS

ADC	Agriculture Development Cooperation
AFC	Agricultural Finance Cooperation
AGRA	Alliance for Green Revolution in Africa
CAN	Calcium Ammonium Nitrate
DAP	Diamonium Phosphate
EU	European Union
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
FSP	Fertilizer Subsidy Programme
GDP	Gross Domestic Product
GOK	Government of Kenya
KENFAP	Kenya Federation of Agricultural Producers
KMDP	Kenya Maize Development Project
KTDA	Kenya Tea Development Authority
MDGs	Millennium Development Goals
MOA	Ministry of Agriculture
NAAIAP	National Accelerated Agricultural Input Access Programme
NCPB	National Cereals and Produce Board
TAMPA	Tegemeo Agricultural Monitoring Project Analysis
USA	United State of America

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agriculture continues to be very important for sustainable development, poverty reduction and enhanced food security in developing countries (Kibaara, Ariga, Olwande, & Jayne, 2008). Food security in particular is still a big challenge and has become one of the key issues to be tackled by both developed and developing countries. The recent reports from FAO (2013) estimate that globally 842 million people, 12 percent of the global population are unable to meet their nutritional requirements. During the December 2006 Abuja summit on food security in Africa, African heads of states deliberated a lot on food security and identified Maize among the other crops, as strategic commodity for achieving food security and poverty reduction (Forum for Agricultural Research in Africa (FARA, 2009). Despite all these, achieving food security is still a major challenge to Developed and in most of the developing countries. Some of these countries have tried to alleviate this problem by providing specific food aid in terms of food relief and also in the form of farm input subsidies so as to increase production (Muendo, 2012).

Most countries in Asia have also adopted the policy on the fertilizer subsidies. Countries such as India, Indonesia and Bangladesh have spent a lot of money on subsidies towards cereal production to increase food security in their countries (Shahidur, Dorosh, and Mujeru, 2013). In India for instance between the year 2001 and 2011, over 50% of the fertilizer used in the country were under the subsidy programs. In Bangladesh, the amount of money spent on subsidy programmes increased between the year 2003 (50 Million USD) and 2009 (800 million USD) (Shahidur et al. 2012). This could be attributed to the importance of subsidy towards food security improvement.

Agricultural productivity levels in Sub Saharan Africa are far below other regions in the world, and are well below those required to attain food security and poverty reduction goals. Majority of the African countries as well have focused on subsidy, targeting maize production as a staple. Subsidy programs that provide inorganic fertilizer to smallholder farmers below-market rates are currently receiving a great deal of attention as a sustainable strategy to foster an African Green Revolution (Denning et al. 2009). Over the past several years many countries including Kenya, Uganda, Tanzania, Zambia, Ghana, Senegal and Malawi had introduced or revived programs that provide inorganic fertilizer and often hybrid

maize seeds to farmers below commercial market prices. The gains from subsidizing fertilizer could potentially be large. Reports indicate that Malawi increased maize production between 26 and 60 percent during the first four years of its subsidy program (Dorward, Chirwa and Jayne 2010). Malawi has a very organized system of farm inputs subsidy which has led to a great impact among the rural farmers. Reports from Malawi indicate that no families depend on food aid and the rate of technology adoption in agriculture has also gone up as compared to some years back when Malawi was having serious problems of food shortage and the country has become a maize exporter (Perkins, 2009).

In Zambia, large-scale fertilizer subsidies were reintroduced in 2002/03 and have been implemented in every subsequent year. The volume of subsidized inputs and the numbers of beneficiaries have increased dramatically over time. For example, while the program aimed at distributing 48,000 MT of fertilizer to 120,000 farmers in its first year, by 2012/13 the scale of the program had increased to 180,000 MT of fertilizer to 900,000 farmers (Ricker-Gibert et al 2013). As the program has grown over time, so has the national maize production, and Zambia recorded three consecutive bumper harvests in the 2009/10 to 2011/12 agricultural years. In a study carried out by Ricker-Gilbert and Jayne (2013) in Malawi and Zambia, it was found out that an additional Kilogram of subsidized fertilizer boosts maize production by 2.76 kilograms. Input subsidy programs, while normally analyzed in terms of their direct impact on recipient households, may also have powerful general equilibrium effects by reducing the price of food. Therefore, the ability of input subsidy programs to lower food prices could have major impacts on the well-being of millions of households in many countries (Ricker-Gibert et al 2013).

In Kenya, agriculture is one of the six key economic sectors expected to drive the economy to a projected 10 percent growth rate annually over the next two decades (Government of Kenya (GOK, 2007). While agriculture remains a fundamental pillar for sustainable development and poverty reduction in the country, it continues to face many challenges and constraints that require urgent and special attention (GOK, 2008**)**. Some of the challenges and especially in maize production are the rising cost of farm inputs and none or low use of key farm inputs that lead to low agricultural production. The high costs of farm inputs such as fertilizer discourage farmers from increasing the hectares under maize production. This also leads to low productivity especially where the soils are depleted and so lack important plant nutrients. Maize is a staple food and a source of carbohydrates to large proportion of people in Kenya

making it one of the most important commodities. About 3.5 million small-scale farmers are involved in maize production, producing about three-quarter of the total maize crop while 1,000 large-scale farmers account for the remaining production (GOK, 2009). Maize deficit is one of the main problems facing Kenya, with the deficit increasing some times to unacceptable levels thus aggravating food insecurity (GOK, 2009). For instance, the ministry of agriculture food situation report, (2014) indicates that the country had a deficit of 10 million bags. There is need therefore to increase maize production in order to reduce the serious deficit in maize supply in the country.

Maize farmers require resources and key farm inputs such as planting fertilizer, certified seeds and top dressing fertilizers to implement the various modern technologies which are disseminated by the extension agents in order to increase food production. The high cost of farm inputs and rising poverty levels can sometimes lead to little participation by resource poor farmers in maize production. There is therefore great need to improve rural maize productivity and incomes to increase food security. This can be done by putting in place programmes to support the rural farmer and more specifically the small scale farmers who are the majority. Some of these programmes include the Fertilizer Subsidy Programme (FSP) which is being implemented by the Kenya government through the National Cereals and Produce Board (NCPB) and National Accelerated Agricultural Input Access Programme (NAAIAP).

When farmers fail to buy and use the recommended farm inputs, there is a possibility of low agricultural production which affects food security in most of the poor households. To address this issue, the Government of Kenya through the Ministry of Agriculture came up with some input supply support programmes such as National Accelerated Agricultural Input Access Programme (NAAIAP). Under this programme, resource poor farmers in some parts of the country including Trans-Nzoia were assisted with farm inputs to grow food crops especially maize on one acre of land in the years 2008 to 2010. The other input supply support programme involves the sale of subsidized fertilizer through the National Cereals and Produce Boards (GOK, 2009). Fertilizer is one of the most important farm inputs in maize growing because it negatively affects yields of maize if not used adequately or not at all. The increase in prices of fertilizer and other farm inputs has been a major hindrance in maize production not only to the small, but also to the large scale farmers who sometimes abandon the enterprise due to losses incurred. This situation whereby farmers become reluctant to grow maize crop as a result of losses incurred may bring food insecurity in the country that

can lead to famine unless the government intervenes with policies to address fertilizer supply chain.

1.2 Statement of the Problem

Maize has become a major staple and cash crop for small holder farmers and is prefered staple for about 900 million poor consumers and about one third of all malnourished children (FARA, 2009). In Trans-Nzoia County, maize is mainly grown as an income generating enterprise and the cost of production per unit is relatively high due to the high cost of fertilizer which had resulted in losses incurred by farmers forcing them to abandoned maize growing for other enterprises like dairy. This had led to maize deficit resulting in serious problem of food security in the county and in the country in general. The Government of Kenya introduced some fertilizer supply support programmes in Trans-Nzoia County which is one of the main producers of maize. This was taken as an intervention measure to encourage farmers to participate in maize growing so as to increase maize production in order to alleviate frequent maize shortages and improve food security in the country. Despite all these interventions, the maize deficit in the country is still high, estimated at 10 million bags (MOA, 2014). This made it necessary to find out on the effects of these interventions on the participation of farmers in maize production in Trans-Nzoia County and the challenges facing the implementation of these programmes

1.3 Purpose of the Study

The purpose of the study was to determine the effect of fertilizer supply support programmes on farmers' participation in maize production in Trans-Nzoia County.

1.4 Objectives of the Study

The study had the following objectives;

(i) To investigate the challenges in provision of subsidized fertilizers in Trans-Nzoia County.

(ii) To determine the difference in quantities of fertilizers acquired by maize farmers before and after fertilizer supply support programmes in Trans-Nzoia County.

(iii). To determine the difference in acreages achieved at farm level by maize farmers before and after fertilizer supply support programmes in Trans-Nzoia County.

(iv). To determine the difference in yields achieved per acre by maize farmers before and after fertilizer supply support programmes in Trans-Nzoia County.

1.5 Research Question

Objective one was converted to a research question as expressed below;

(i) What are the challenges associated with the provision of subsidized fertilizers in Trans-Nzoia County?

1.6 Hypotheses of the Study

The study was guided by the following null hypotheses which were derived from objectives ii, iii, and iv respectively.

$H_{01:}$ There is no statistically significant difference between quantities of fertilizers acquired before and after fertilizer supply support programmes for maize production by farmers in Trans-Nzoia County.

$H_{02:}$ There is no statistically significant difference between acreages achieved at farm level before and after fertilizer supply support programmes under maize production in Trans-Nzoia County.

$H_{03:}$ There is no statistically significant difference between yields achieved per acre before and after fertilizer supply support programmes under maize production in Trans-Nzoia County.

1.7 Significance of the Study

The findings of this study may guide the policy makers to formulate policies concerning extension services and issues affecting farmers in relation to maize production. The findings of this study can enable the implementers of the above fertilizer supply support programmes to review the way the programmes are being implemented for farmers to benefit fully because it has proved that the fertilizer supply support programmes can encourage farmers to participate in Maize Production. The findings have highlighted the benefits and challenges that may have been experienced in the programmes which if addressed fully can make the programmes to be more cost effective, efficient and sustainable.

1.8 Scope of the Study

This study covered Trans-Nzoia County where both small scale and large scale farmers were interviewed to provide information on the effects of fertilizer supply support programmes on participation by farmers in maize production. The study was concerned with the challenges in the subsidy programme and the changes that the fertilizer supply support programmes brought in terms of fertilizer use, acreages and yields achieved among maize farmers who were involved in the programmes. Factors studied were age, gender, levels of education, and enterprises on the farms. The effect of fertilizer supply support programmes on participation of maize farmers such as subsidy and NAAIAP programs were investigated including the challenges in the provision of subsidized fertilizer.

1.9 Limitations of the Study

The study had the following limitations;

(i) Farmers who did not keep their records well on purchase of fertilizer had difficulties in getting all the records in time and had to be given more time.

(ii) Some farmers could not give the exact figures on the production but approximation due to poor record keeping at the time of harvesting.

1.10 Assumptions of the Study

(i) The study assumed that all the respondents operated under similar socio economic conditions and were equally involved in the fertilizer supply support programmes, and that any change in maize production was as a result of the above support programmes.

(ii) It also assumed that all the respondents gave their honest opinions and genuine concerns as relate to the programmes.

1.11 Definition of Operational Terms

The following are operational definitions of terms used in this study.

Efficiency in Fertilizer Subsidy: to be efficient is to work well, quickly and without waste. In this study to be efficient in fertilizer subsidy programme refers to how promptly farmers are able to access the subsidized fertilizer through the government departments in charge of the programme after application without wasting time much time and resources.

Farm Input: Farm inputs are a range of materials, which may be used to enhance agricultural productivity (Baltzer and Hansen 2011). In this study farm inputs simply refer to fertilizers that are used for planting and top dressing of maize.

Farm input accessibility: Input means something that is put in for use, while accessibility means the ability to enter or obtain something. Farm input accessibility, according to this study meant the ability of the farmer to obtain easily at reasonable prices the resources needed to grow maize, like fertilizers, pesticides, and the cost of land preparation.

Fertilizer subsidy: Subsidy means money paid, especially by the government or an organization, to make prices lower, or to make it cheaper to produce goods. Fertilizer subsidy refers to all mineral fertilizers sold to farmers at lower prices by the Ministry of Agriculture than the prevailing market prices to increase their maize yields. This is meant to make them food secure and get surplus for the market. In this study fertilizer subsidy meant the lowering prices of fertilizers which have been purchased in bulk by the Kenya government and stored in National Cereals Produce Board stores where they are sold to the maize farmers at a lower price.

Fertilizer supply support programmes: Support means to bear the weight of something so as to keep in place or prevent from falling, According to this study fertilizer supply support programmes are the support mechanisms put in place by the government to assist farmers get fertilizer easily and at reasonable prices that can enable them get profit in order to motivate them to continue growing maize. The fertilizer support programmes according to this study are the Fertilizer Subsidy Program (FSP) being implemented through National Cereals and Produce Board and the National Accelerated Agricultural Input Access Programme (NAAIAP). Fertilizer Subsidy Programme is a programme in which the government sells fertilizer to farmers through the National Cereals and Produce Board of Kenya at subsidized costs.

Under this programme, the government of Kenya imports fertilizer in bulk and distributes it to the stores of National Cereals and Produce Board where farmers access it at subsidized cost after approval by the Ministry of Agriculture. The extension officers from Ministry of Agriculture must confirm that a farmer has a certain number of acres and recommend the quantity of fertilizer for the farmer to buy the fertilizer from NCPB's stores.

Food Security: According to the World Health Organization (WHO), Food Security is achieved when all people, at all times have physical and economic access to adequate/sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. "Food security therefore is not the physical availability of any single commodity; such as maize in the Kenyan context. Neither does it imply just the availability, but must be accessible. In this study, food security is used to refer to the state where a household has enough maize to cater for its needs for the whole year up to next harvest and even have some for sale to the neighbours to meet other household needs including acquiring farm inputs for the next season.

Free Fertilizer: In this study, refer to the fertilizer given to the farmers free by the Ministry of Agriculture through the NAAIAP Programme.

Participation in maize Production: The word participation means taking part or sharing in an activity or event. Participation in crop production according to Saghir, Zakaria, & Asif. (2005), means getting actively involved in activities related to crop production. According to this study, participation in maize production meant increased involvement of farmers in maize production which is realized through an increase in acreages, adequate use of fertilizer and increase in yields under maize.

Resource Poor Farmer: Resource poor farmers are those who meet challenges in terms of access to farm inputs that can enable them to meet the production requirements of various farm enterprises; they are normally characterized by small land holdings, and inadequate food production, (Republic of Kenya 2009). In this study, resource poor farmer means a farmer who does not have adequate finances to procure adequate farm inputs to enable him grow maize and get good yields.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews related literature to the study, it covers maize production challenges, production trends, fertilizer subsidy and the various fertilizer support programme initiatives put in place in some countries and more specifically in Kenya's agricultural sector to boost food production such as maize. These fertilizer support programmes include Fertilizer Subsidy Programme (FSP) and National Accelerated Agricultural Input Access Programme (NAAIAP).

2.2 Maize Production and Challenges

Maize also called corn is one of the most important and strategic cereal crops in Africa and the developing world in general. It is produced in different parts of the continent under diverse climatic and ecological conditions. Due to its increasing importance, maize has become a major staple and cash crop which its availability determines the status of food security in many countries. The crop has many challenges that affect its production ranging from poor soils, use of incorrect and inadequate amount of inputs, unfavourable weather conditions, diseases and pests. Adequate use of inputs, especially fertilizer has been considered as one of the key interventions that can boost maize production, and so most countries try to ensure that farmers get access to this input through subsidy programmes where necessary.

2.2.1 Production Challenges

Agriculture plays a dominant role in most societies and farming is still a major source of household income and food among the rural population. As indicated by Zimmerman and Bruntrip (2009), agricultural production is important for growth, getting large number of people out of poverty, and is a principal route to meeting some of the Millennium Development goals (MDG's). Maize production is one of the most important enterprises in agriculture that contributes to food security in most countries in the world. While maize as staple is quite important in terms of food security, it faces various challenges. Some of these challenges are; high cost and low application of key farm inputs, low application of modern technologies, incidences of pests, diseases, low availability of capital and low crop yields (GOK, 2008)

It has been found that the availability of working capital and accessibility to inputs by farmers play a major role in adoption of modern technologies in agricultural production than just awareness creation by extension officers. The accessibility to inputs by farmers continues to be a great challenge yet it is critically important in improving agricultural productivity and growth. This challenge needs to be addressed urgently by the people and institutions concerned for any meaningful improvement on agricultural production and food security.

2.2.2 Production Trends

Reports from FAO indicate that American continents are the main producers of maize in the world. In 2008, North America recorded the largest production of maize with about 38.8% of the global output. This was followed by ASIA (28.5%); South America (11.2%); Europe (11.1%); Africa (6.9%); and Central America (3.9%) (FAOSTAT, 2013).

Africa is a minor producer of maize, accounting for only about 7% of global production. Average annual production was estimated at 49 million tons during the period 2005-2007; increasing from 32 million tons during the period 1985-1987. Maize yields in Africa are quite low by world standards and average 1.7 tons/ha in 2006 compared to the global average of about 5 tons/ha (FARA, 2009). This report indicates that yields have increased only marginally over the last two decades. Most of the increase in production had come from expansion in the area harvested rather than from increases in yield. The area harvested increased from 131 million hectares in 1986 to 152 million hectares in 2006. This represents about one fifth of the global area harvested.

Sub-regional analysis of maize production reveals that Southern Africa, Central Africa and West Africa are the main maize-producing sub-regions in Africa. The member States of these three sub-regions produce more than 65% of the total quantity on the continent. Maize production within the Central African sub-region was estimated at about 0.97 million tons. Production within the Eastern African sub-region rose from 7.2 million tons in 1986 to 8.1 million tons in 1996, and subsequently declined to 7.8 million tons in 2006 (FARA, 2009). .

As Kenya's staple food, a lot of emphasis is laid on maize production and 90 percent of the rural households in Kenya grow maize. Production of maize is dominated by small scale farmers who produce 75 percent of the overall production; the other 25 percent is grown by large scale farmers (FAO, 2011). In recent years there has been an expansion of land used for maize production as evidenced by 1.7 million hectares in 2008 and 1.8 million hectares in

2009 but this was not enough. This was actually less than the 2009 Ministry of Agriculture targets which aimed for 2.2 million hectares (FAO, 2011).

Maize growing in Kenya is concentrated in the Rift Valley region in Counties such as Trans Nzoia, Uashin Gishu and Nakuru, a region often referred to as the 'Granary of Kenya'. Rift valley alone produced over 13 million bags (1.17 million tons) in the year 2009 under 644, 895 ha (GOK, 2010). In figure 1 which shows the production proportion of maize per province between the years 2000-2008, it can be observed that; Rift Valley is increasingly becoming an important source of grain while Nyanza is declining in maize production. The decline in maize production in most of the regions leads to a maize deficit that causes the country to import maize from outside. During bumper harvests, Kenya exports its maize to Tanzania, Uganda, Rwanda, Zaire, Sudan and Ethiopia. But during scarcity Kenya imports maize from USA, South Africa, and Zambia (GOK, 2010).

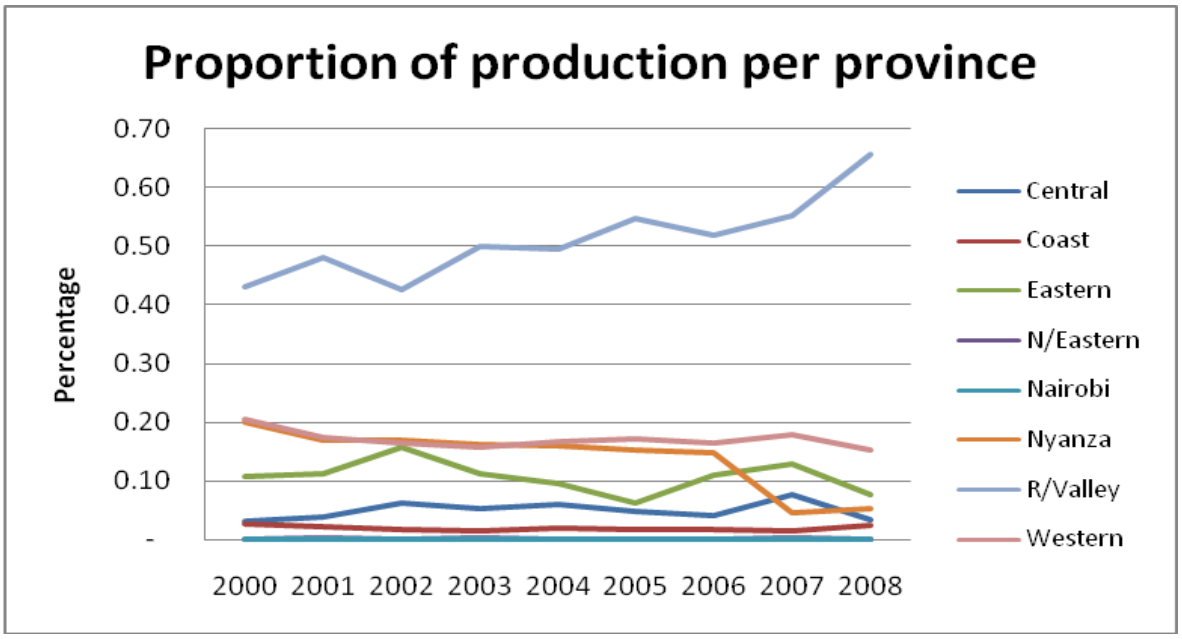

Figure 1: **Contribution of Regions to National Production of maize: 2000-2008**

Source: Ministry of Agriculture, Crop Development Division, 2008

According to FAO (2011), the National maize production ranges between 24 and 33 million bags per annum which does not keep pace with the domestic consumption levels, for example in 2008, the consumption was estimated at over 36 million bags. This maize shortfall could be attributed to the increase in urbanization, high reliance on maize based diets as the staple food, evidenced by the high consumption figures of 98kg/per capita/year and low per capita production. With the country's population projected to be 43.1 million by the year 2020, the

demand for maize is then likely to be 5 million metric tons (55 million bags). This means that based on the prevailing maize production rates, the maize deficit will be around 1.2 million metric tons (13 million bags) in 2020.

Maize farming in Kenya has been a deeply rooted practice for many years with declining commercial appeal. This trend can be attributed to several things such as poor quality seed and low adoption of improved practices. Others include use of inappropriate or inadequate fertilizers, poor access by smallholders to markets, weak producer organizations and weak human resource capacities (KMDP, 2011).

Kenya's maize production figures started falling in the year 2006 with the worst production decline in 10 years recorded in the year 2009 (KMDP, 2011). This downward trend has been caused by; land fragmentation due to increased pressure on land caused by ever increasing population, costly credit and a generally negative attitude by farmers towards financial institutions which have resulted in dismal production figures.

Even though Kenya's general agricultural productivity in terms of maize has been having challenges in the last decade, it is important to understand how it relates to production in other areas. This will provide an indication on the potential the country has in further improving its agricultural productivity. Kenya's maize production (9 bags/acre) is better than Tanzania (4 bags/acre), Uganda (7 bags/acre), and Malawi (7 bags/acre) but is lower than the production in Argentina (31 bags/acre) and South Africa with a production of 13 bags/acre (Ariga, Jayne, Kibaara, & Nyoro, 2008). Productivity of maize as a national staple food item also declined in 2008 and this was attributed to the high cost of farm inputs including fertilizers and fuel. In volume terms, production fell by 19 percent from 32.5 million bags in 2007 to 26.3 million bags compared with an estimated consumption level of 36 million bags (GOK, 2009). However, according to the economic review report (2013) from the ministry of Devolution and planning, the production improved to 34.4 million bags in 2011 and 40 million bags in 2012

The high production costs mainly due to high input prices especially those of fertilizer have led to the maize grain deficit to unacceptable levels thus aggravating food security especially among the poor (GOK, 2009). The high cost of maize production has discouraged farmers to grow the crop because they sometimes do not get profit especially for farmers who grow maize for commercial purposes. Some farmers even abandoned the crop, something that can lead to very high food insecurity status in the country. The situation can be made worse by the fluctuating maize prices in the country. Maize prices are very low immediately after

harvesting and a 90 kg bag of maize can costs even ksh 800. This makes the traders and millers buy almost all the maize stock farmers have at that time, hold them, and later sell them at exorbitant prices of even Ksh 4000 per 90kg bag when there is an acute shortage of the commodity in the country.

A study done in Trans-Nzoia in 2008 where all categories of farmers are found for instance showed that farmers use high levels of inputs. The cost of producing a 90 kg bag ranged between Ksh. 1,045-1556 in 2007 and Ksh. 1233-1842 in 2008. The producer margins for 2007 were all negative for all farm categories. This could be attributed to low producer maize prices based on costs of production as compared to the prices in 2008 (GOK, 2009).

As indicated by Nyagito and Ndirangu (1997), the producer prices and the corresponding profitability of the crop in any one year lead to an increase in acreages and production in the following year, and vice versa. Thus there is a direct relationship between the profitability and acreages under maize.

2.3 Fertilizer Subsidy

Fertilizer is a very important component in maize production because it helps to boost soils that are already depleted in terms of nutrients. The major cost components in maize production are fertilizer (34%), land preparation and use of machinery (29%), seeds (10%), and labour (27%). This shows that purchasable inputs (Fertilizer, use of machinery equipment, and seed) are the major cost items in maize production making up about 73 percent of the total production costs (Nyangito & Ndirangu, 1997). This means that any intervention in the input supply chain must address these key areas in maize production. This can be achieved through subsidies in the costs of farm inputs such as fertilizers, pesticides, and diesel. Most governments in the world have for a long time been providing public support to their domestic agricultural sectors through a wide range of direct and indirect supports to farmers. These supports have been done through various incentives such as price subsidies of fertilizers, seeds, electricity, pesticides, credits and other supports that can induce farmers and maintain them in agricultural production. These policy measures have been widely used in the last half of century to encourage the adoption of modern methods of farming which have led to substantial increases in food production in many parts of the world.

According to United Nations Development Program, (UNDP) developed countries have been criticized by the international community for decades for heavily subsidizing their agricultural sector. This has driven the prices of their commodities to artificially low levels, making it difficult for farmers from the developing countries to compete with their exports. It has long been argued that the farming subsidies used by the West, especially the United States of America (USA), the European Union and Japan cost billions of dollars in terms of lost revenue to the developing world, making those nations to be much poorer. Farmers in USA, who benefit from such support programmes and are assured a minimum floor price for their crops as well as additional government payment, can sell their crops at such low prices in the global markets. Most of the Asian countries had also benefited from input subsidies, as reported by Dorward, (2009) with much success in Indonesia. Analysis done earlier suggest that subsidies can have great effect on food availability. Dorward et al (2004), when evaluating green revolution in Asia argued that sustainable input subsidies can lead to successful green revolution.

It is important to note that the economic liberalization in the 1990s led to the abolition of many state-led agricultural interventions including input subsidies in developing countries. This aid cutback contributed to stagnating crop yields and reduced food security in many rural households. Hoping to reverse these unintended consequences, several governments are now considering a return to input subsides, but in a carefully targeted form. In a study done by Overseas Development Institute, several important issues were noted under the farm input subsidies. Wiggins and Leturque (2010), who carried out the study, noted that Subsidies can help overcome poor farmers' inability to obtain credit or take risks, to allow farmers to learn about inputs, and to develop a better input supply chain. Subsidies can also be justified on grounds of equity, to overcome soil degradation and improve soil quality in the case of fertilizer, and to stimulate production to reduce the cost of food. It was also noted that where subsidies are used, they need to be 'smart': targeted to those who need them, limited in time, and designed to enhance commercial distribution rather than supplant it. But on the other hand subsidies can be costly, with costs rising over time, difficult to remove, badly targeted so that richer farmers get much of the benefit, and can undermine the development of commercial channels.

Most countries in Africa have also raised their agricultural productivity through input subsidies; some of them include Zimbabwe, Zambia and Malawi. Zambia has been implementing fertilizer subsidy for a long time and has been able to disburse 66,000 Mt of

subsidized fertilizer every year. This has been imported by private companies under government tender and later distributed to farmers through cooperative societies (Banful, 2008),

An evaluation done by Baltzer and Hansen (2011) on the agricultural input subsidies in Sub-Saharan Africa revealed several findings. In this evaluation it was noted that subsidizing agricultural inputs is controversial. On the one hand, agricultural input use in Sub-Saharan Africa is very low by international standards, and the hope is that subsidies may induce farmers to adopt the use of inputs and thereby increase agricultural productivity. On the other hand, many economists argue that agricultural subsidies of all kinds are expensive, mainly benefit the wrong people, and distort agricultural markets by encouraging farmers to overuse whatever is subsidized. So there is a feeling that subsidy programmes should therefore adhere to a number of design principles such as being target specific, must have market based solutions and also must have an exit strategy (Baltzer & Hansen, 2011). Smart subsidies should be targeted specifically at farmers, who do not already apply agricultural inputs, as well as the poorest and most vulnerable households. This reduces the risks of displacing commercial (non-subsidized) input sales and promotes poor growth. The programmes should utilize and support further development of the existing private input supply networks. Smart subsidy programmes should also devise credible exit strategies to put a time limit on the support. These three characteristics are largely complementary. If subsidies are well targeted, the greater demand for inputs is likely to encourage potential entrepreneurs to establish new businesses, which may promote the development of a competitive input market. However, if the subsidized inputs primarily displace commercial input sales, private dealers are hurt by the "unfair" state-supported competition and may choose to exit the market, thereby reducing competition. Similarly, the more efficient the targeting and input delivery system, the more effective and credible the exit strategy will be (Baltzer & Hansen, 2011).

Recent years have seen a resurgent interest in large scale input subsidies, and particularly fertilizer subsidies, in agricultural development and food security policies in Africa (Dorward, 2009). This has been witnessed in countries like Malawi, Zambia and Ghana among other African countries.

Malawi is one of the countries in Africa which has witnessed great success in maize production as a result of the input supply support initiatives. Malawi was initially in the grip of a terrible, drought-induced famine that left nearly 40 percent of the population in need of food aid (Perkins, 2009). Yet within two years after the subsidy programmes it had become a

net maize exporter. Having enough rain had helped, but twice as important, according to independent assessment, has been government subsidy support in the supply of seed and fertilizer. It has been found that there is a renewed interest in increased agricultural productivity as an engine for wider growth in Malawi. Food security for the 80 percent of Malawians who farm smallholdings was the first, but not the only objective. In Malawi farmers stopped depending on food aid and the rate of technology adoption went up and the foreign earnings had risen (Perkins, 2009).

Some organizations had also been involved in farm input supply support to farmers as well with an aim of increasing agricultural production among the resource poor farmers. One of them is the Alliance for Green Revolution in Africa (AGRA), which is supported by Rockefeller Foundation in partnership with the Bill and Melinda Gates Foundation. It has been instrumental in farm input support and other programmes among the small scale farmers across Africa. The organization aimed at ensuring that smallholders had what they needed to succeed such as good seeds, healthy soils; access to markets, information, financing, storage and transport; and policies that provided them with comprehensive support through developing Africa's high-potential breadbasket areas, while also boosting farm productivity across more challenging environments,

AGRA began to formally engage with governments and other stake holders in form of its target countries such as Ghana, Mali, Mozambique and Tanzania which identified their grain baskets areas and planned for their development, a move that had been very successful. Food security in Africa remains a goal and achieving this goal requires a uniquely African revolution, one that puts farmers at the heart of the development agenda, promotes change at each step in agricultural value chain. Achieving an African revolution requires good policies and support to especially small holder farmer (AGRA, 2009).

Smallholder farmers, who are resource poor and mostly women, dominate our agricultural landscape. They are the fundamental force that drives our agricultural engine of growth. These farmers need to be empowered and assisted to enjoy the fruits of agricultural research and development of better seeds, good fertilizers, better agronomic practices, better markets and better policies. In southern highlands of Tanzania, one of the country's bread baskets produced a record maize harvest in 2008/2009 due to some government interventions. The Minister for Agriculture in Tanzania attributed this success to comprehensive efforts made to

increase availability of fertilizers and good seeds, unlocking of affordable credit for agriculture, and opening up of new market for farmers (AGRA, 2009).

Dorward(2009), in his study on the role of subsidies in reducing input affordability problems, noted that access to seasonal finance is widely considered to be a major constraint on input use on staple food crops, especially among poorer farmers. But he found out that subsidy programme helped to increase maize productivity from 30 to 40 percent in Malawi with a substantial increase in fertilizer use.

In theory farmers can finance input purchases from farm savings, from non-farm income sources or by borrowing. However small farm households are rarely able to save enough to fund significant intensification, and few have access to sufficient non-farm income sources for this purpose (Dorward, 2009).

The conventional argument for subsidies in agricultural development is that their primary role is to promote adoption of new technologies and thus increase agricultural productivity. Subsidies do this by allowing farmers to access purchased fertilizers and improved seeds at lower cost, thus reducing the disincentives to adoption that stem from farmers' cash constraints, risk aversion and low expectations of returns from investments in inputs (Dorward, Hazel & Poulton, 2008). Conventional wisdom on the difficulties with input subsidies is that their costs are very difficult to control; this depends partly on the way the subsidies are delivered..

2.4 Fertilizer Supply Support Programmes in Kenya

The major inputs in agriculture are seeds, fertilizer, pesticides and farm machinery. The input supply support programmes which are meant to assist farmers must therefore focus on the above types of inputs. Some of the main support programmes that have been put in place to assist farmers in Kenya are; National Accelerated Agricultural Inputs Access Programme (NAAIAP) and Fertilizer Subsidy Programme through National Cereal and Produce Board (NCPB).

2.4.1 National Accelerated Agricultural Inputs Access Programme (NAAIAP)

The Ministry of Agriculture has over the last four years made deliberate efforts to ensure availability of affordable farm inputs such as fertilizers and seeds to the farmers. This has been possible through programmes such as National Accelerated Agricultural Inputs Access

Programme (NAAIAP). This Programme was started in July 2007 in some counties in Kenya including Trans-Nzoia with an aim to assist resource poor farmers with inputs to grow maize on one acre of land and targeted 2.5 million small scale farmers who were not using agricultural inputs due to economic challenges (GOK, 2009). The programme targeted and assisted the small scale resource poor farmers within the community with inputs to plant one acre of maize. These farm inputs included; 10 kg of maize seed, 50 kg each of planting and top dressing fertilizers. The main objective was to assist farmers to start off farming for food production. Farmers were also expected to save some income from the surplus production in order to buy farm inputs for next season's crop production with an aim to increase the acreages under maize production. The programme had 2 components namely Kilimo Plus and Kilimo Biashara. Kilimo Plus targeted the resource poor who were provided with a package of seeds, fertilizer and training to cultivate at least one acre of land to meet household needs and surplus for sale. These inputs were provided free of charge through voucher system for a year but the farmer had to meet the cost of land preparation and other crop husbandry practices. Kilimo Biashara as the second component targeted the more endowed farmers providing them with low cost credit to purchase inputs.

According to the Ministry of Agriculture (2012), the government with support of various donors, which included World Bank and European Union, had spent over ksh3.7 billion in the last four years in supporting vulnerable farmers in 102 districts across the country. According to this report, the Government initiated NAAIAP to address problems of food insecurity and poverty amongst the resource poor farmers. NAAIAP was meant to build farmers' capacity to mobilize their own resources for re-investment in agricultural inputs in subsequent seasons after the grant. Reports indicate that most farmers had benefitted a lot from the programme in regions such Taita Taveta, Malindi, and other areas like Loitokitok, where farmers had not only increased yields but also the subsequent acreages (MOA, 2012).

2.4.2 The Fertilizer Subsidy Programme (FSP) in Kenya

In Kenya the subsidy programme was started through the Ministry of Agriculture. In this programme the fertilizer is sold to farmers through the National Cereals and Produce Board at subsidized prices. The farmers normally access this fertilizer after getting a recommendation from the Ministry of Agriculture's Extension officers on the number of bags to be purchased based on hectares the farmer wants to plant maize.

This initiative came after realizing that less than 30 percent of the farmers in the high potential areas who own about 1 acre of land use fertilizers and improved seed. In the lower potential areas, fertilizer use is less than 20 percent among the farmers in the same category (GOK, 2009). The main reason for this phenomenon is that resource poor farmers may not have the knowledge but most importantly, cannot afford the cost of these inputs. The consequence is that soils are depleted of nutrients and farmers obtain very low yields. This is one of the main causes not only of declining agricultural productivity but also of increasing food insecurity and abject poverty.

In order to address the issues raised on the availability of farm inputs to farmers in Kenya, there were interventions which had been identified in line with Vision 2030. Some of the interventions which had been implemented by the government included improvement in the coordination of bulk purchasing, provision of incentives for local blending of fertilizer and exploration of long term opportunities for domestic production. To improve farmers' accessibility to fertilizer, it was necessary to enhance accessibility to affordable inputs through subsidy to farmers (GOK, 2009)

The government had rolled out input subsidies at the height of global hike in fertilizer prices which shot from 2500 to 6000 Kenya shillings for a 50kg bag of CAN (Owuor, 2010). Farmers could not afford this input and the government stepped in to salvage the situation. What followed was a series of events that ensured that the farmer acquired vital input at affordable rates. Seeds from Kenya seed Company were also subsidized. The National Cereals and Produce Board (NCPB) was charged with the duty of stocking and selling the subsidized fertilizers. This in actual sense meant that the NCPB was made a one-stop shop for farmers. Studies done by Owuor (2010), indicated that as much as the government subsidized production, both seeds and fertilizers were not enough and more often than not were supplied too late after the farmers had planted. This means that most farmers did not get the subsidized input; and some of those who were privileged to get it, got it too late after they had used their money to buy the un-subsidized ones.

Farmers also found the procedure put in place for acquiring these subsidies to be very long, hectic and bureaucratic, yet open to abuse (Owuor, 2010). The Kenya government decided to subsidize the price of fertilizer both for planting and top dressing of maize in order to assist farmers who could not afford the fertilizers sold at the private shops. At the time of this study the prices of DAP and CAN were ksh 3500 and ksh 2500 respectively at the private stockists

while at the Cereal Board the products were costing ksh 2500 and 1600 respectively. This was a very high subsidy done by the Kenya government (28% for DAP and 30% for CAN) and was meant to boost maize yields, acreages under maize, farmers' incomes and food security levels among the households.

2.5. Theoretical Framework

This study was guided by the theories of motivation and incentive. Motivation is the force that initiates, guides and maintains goal-oriented behaviors, it is what causes us to take action over something. The forces that lie beneath motivation can be biological, social, or emotional in nature. According to Roy Radner, the author of incentive theory as explained by Cory Schop (2011), motivation generally comes from internal or external forces that either awaken or increase a person's enthusiasm to pursue a particular action.

Motivation is said to be intrinsic or extrinsic. Intrinsic motivation refers to motivation that is driven by an interest or enjoyment in the task itself, and exists within the individual rather than relying on any external pressure. Extrinsic motivation comes from outside of an individual. In this case farmers need to be motivated to continue in production as a result of the challenges they face. One of the extrinsic motivations in this case was the good prices offered to them because of relatively low cost of production that was realized after subsidized costs of fertilizers. Good yields that was realized after the use of the correct quantity of farm inputs was intrinsic in nature.

According to the other authors such as Booner and Sprinkle (2002), there is a relationship between monetary incentives, effort and performance. It is thought that monetary incentives will increase effort and performance. People act to maximize expected satisfaction with outcomes and people are motivated by two things; what they think the payoff is for a particular behavior and (in this case, money) how much they value that payoff (research shows people value monetary payoff over non-monetary payoff). The combination of these two factors is what motivates people. In other words, people make more effort when performance-based incentives are used because they believe they will get money when they perform as expected (Booner & Sprinkle, 2002). The government for instance, can apply incentive theory to structure farmers' compensation in terms of subsidies, transportation of farm inputs closer to farmers as an incentive to make them participate actively in maize production, which will make them realize their goals in terms of profit maximization.

2.6 Conceptual Framework

The conceptual frame work in Figure 1 shows how the fertilizer supply support programmes such as subsidy in the cost of farm inputs, and availability free farm inputs such as fertilizers to farmers through NAAIAP Programme can motivate them and act as incentives which can lead to an increase in maize production. These support programmes were expected to have a direct effect on the acreages under maize production and maize yields per acre. The other effect was on the number of farmers demanding fertilizer because the incentives in the form of free and subsidized fertilizers can enable many farmers to demand more fertilizer due to the reduced cost in terms of acquisition and awareness creation. This is shown by the arrow at the top moving from independent variable to dependent variables which in this case are the outcomes of such support programmes.

These theories of motivation and incentive have been adapted in this study since by subsidizing farm inputs to farmers, there is likely to be an element of motivation or incentive that will lead to an increase in yields per acre and overall production since more land will be brought under maize production. These positive changes led to an increase in food security levels not only in the maize growing areas but also in the whole country. But these support programmes could have also been influenced by factors such as farm size, age, gender, and education level of the farmer. The larger the farm size the more acreages was available for maize production, and the farmers who are still strong in terms of age could pay more attention to farming activities than the ones who are advanced in age. Gender would also play a role in terms of which gender plays a major role in maize farming. Education level would affect some farmers since it opens up opportunities for other sources of income that can assist in some farming activities.

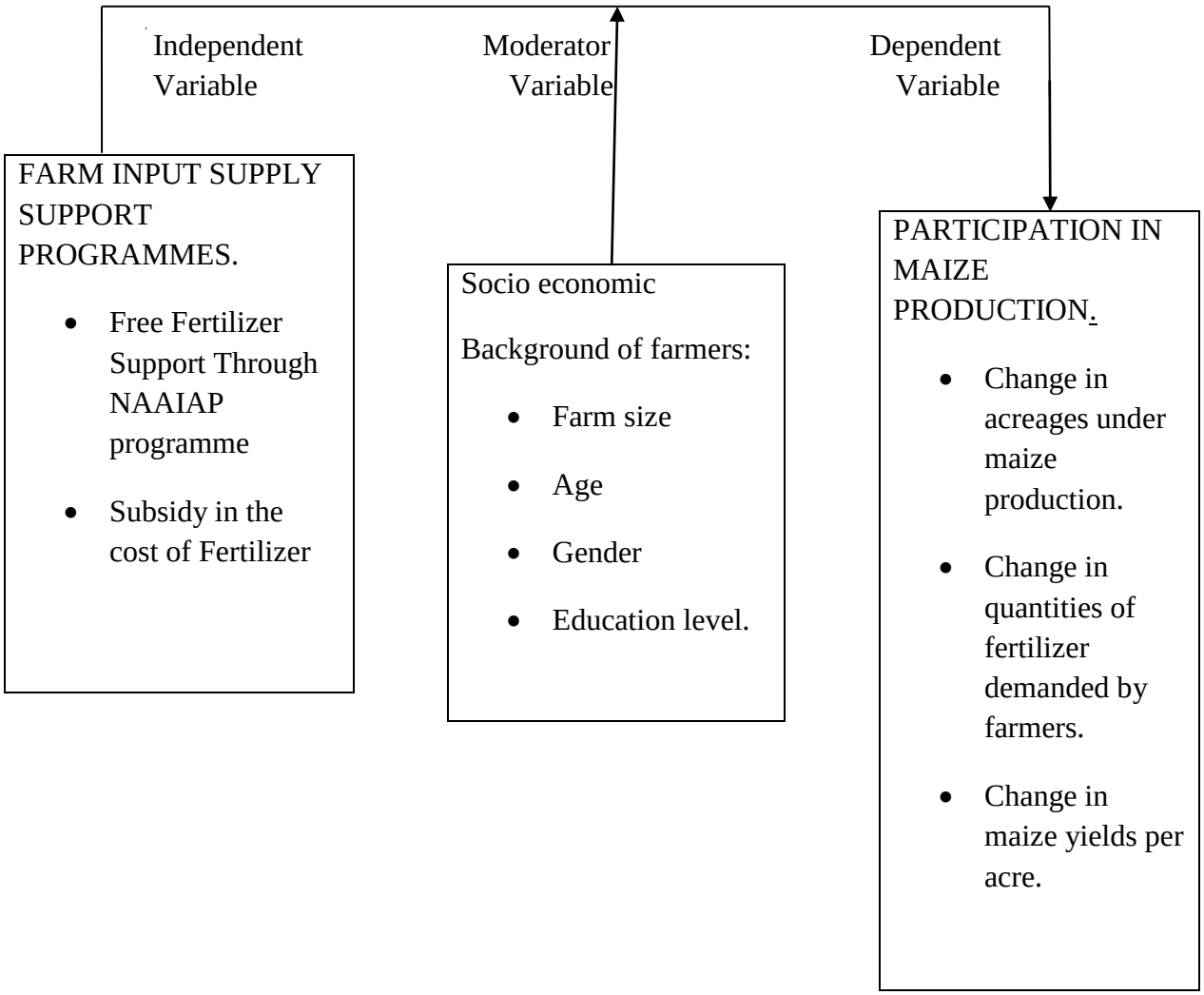

Figure 2: **Conceptual Framework Showing the Effects of Fertilizer Supply Support Programmes.**

2.7 Summary of Literature Review

The literature review show that most studies found out that accessibility to farm inputs by farmers is a great challenge due to their high costs and so most countries have adopted the subsidy programmes as an intervention measure to assist farmers. The literature review shows that subsidy programmes have been used in many countries in Europe, America, Asia and in Africa. Studies done by Dorward, (2009) in Asia and other African countries, indicated that through subsidies production can increase. It showed that in Malawi maize production increased from 30 to 40 percent, the fertilizer use also increased.

Other studies done by Wiggins and Leturque (2010), show that subsidies can help farmers to learn about the usefulness of farm inputs and through their use this can lead to an increase in

acreages and yields. A review in most African countries showed that countries like Malawi, Zambia, Zimbabwe, and Ghana have raised their productivity through the subsidy of farm inputs.

The literature available shows that much work has been done on the effects of fertilizer subsidy on the production of maize but no study has been done in Trans-Nzoia county to find out their effects on maize production, making it necessary to carry out this study..

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research methodology that was used in this study. It discusses the research design, the population target, the sampling procedure and sample size, the data collection procedure, data processing and analysis.

3.2 Research Design

This study employed a cross-sectional survey because it is a suitable tool for assessing opinions and trends (O'Connor, 2011). A cross-sectional survey collects data to make inferences about a population of interest at one point in time. Cross-sectional surveys have been described as snapshots of the populations about which the data is gathered (Hall, 2011). This research study was expected to find out the effects of the fertilizer supply support programmes on participation in maize production by farmers in Trans-Nzoia County.

3.3 Area of the Study

The study was carried out in all the former districts of Trans-Nzoia County namely Trans-Nzoia East, Trans-Nzoia West and Kwanza. Trans-Nzoia County is located between the Nzoia River and Mount Elgon and its centre is the town of Kitale. Farming in this area was initially done on large scale by the white settlers. After independence many of the farms which were vacated by white settlers were bought by individuals from other ethnic groups in Kenya.

The County has five constituencies namely, Cherangani, Kwanza, Endebess, Kiminini and Saboti. Trans- Nzoia County is one of the main producers of maize and normally produces between 4 and 6 million bags of maize (Ministry of Agriculture (MOA), 2010). Other crops grown in the county include Horticultural crops (mainly the vegetables), sunflower, wheat, finger millet and sweet potatoes.

Trans-Nzoia borders West Pokot in the North, Bungoma County in the South, and Uashin Gishu in the East which are also good producers of maize except West Pokot which has some arid areas with pastoralists' activities. Trans-Nzoia is located at latitude 0°52´-1°18´S, and longitude 34°38´-35°23´E. The human population is about 818,757 and a density of 741 persons per square kilometer (Kenya National Bureau of Statistics (KNBS), 2010).

The County covers an estimated area of about 2460 km^2 with a bimodal rainfall pattern with annual rainfall ranging from 1800 to 1900mm. The County is covered by three main agro-ecological zones which include: Upper Humid (UH) Upper Midland (UM) and Tropical alpine (TA). The altitude ranges from 1000 to 1200 meters above sea level (Wanyama & Mose, 2009).

3.4 Population of the Study

According to the Trans-Nzoia District Agriculture office (2010), there were a total of about 60,000 farm households in Trans-Nzoia County that grew maize on one acre and above out of which 20 percent (12,000 farmers) got access to the fertilizer subsidy programme from the seven Divisions of Trans Nzoia County in the year 2009. This study covered only three divisions of Trans-Nzoia which were Kiminini, Kwanza and Kaplamai where about 3,000 farmers accessed the fertilizer subsidy during the same year. Among the 3000 farmers who got access to fertilizer subsidy programme, the ratio of large scale to small scale farmers was 2:3, therefore there were about 1,200 large scale farmers and 1,800 small scale farmers giving a total of 3,000 farmers, this group formed the target population in the fertilizer subsidy programme. On the other hand, the target population under the NAAIAP programme composed of 300 farmers who successfully implemented the Programme in the same year. The total target population under the two programmes was therefore 3300 farmers.

3.5 Sampling Procedure and Sample Size

According to Ballian (1988), sample sizes may be determined using statistical or non-statistical ways and sample sizes are commonly derived from previous studies, mentor recommendations, or budgetary constraints. Although the nature of the study can dictate the specific size of the sample to be used, sample sizes usually range from 60 to 300 respondents with most averaging about 200 (Ballian, 1988).

According to O'Connor (2011), surveys vary widely in sample size and sampling design. A distinction can be made between large-scale, small-scale, and cross-cultural studies. Typical large-scale surveys of a national population use a sample size of 1500-3000 respondents, but can run much larger. Small-scale surveys (also called micro samples) as with typical graduate student research, usually uses a sample size of 200-300 respondents (O'Connor, 2011).

3.5.1 Sampling Procedure for Subsidy Programme

In this study, out of the study population of 3,000 farmers under the subsidy programme, a sample of 150 farmers was randomly selected. The study employed Stratified random sampling technique to select a total of 150 farmers. This was done because the population was not homogenous. As indicated by Kothari, (2004), if a population from which a sample is to be drawn does not constitute a homogeneous group, stratified sampling technique is generally applied in order to obtain a representative sample. So there were two main stratum consisting of large scale and small scale farmers. Small scale farmers in this study were the ones planting less than 20 acres of maize while large scale farmers were the ones planting more than 20 acres of maize.

This was done by first preparing a list of 400 large scale farmers and 600 small scale farmers from each of the three Divisions. A final sample per category was then selected through simple random sampling where every twentieth farmer in each category of small (600 farmers) and large (400 farmers) scale farmers was picked from the two lists per Division. This enabled the researcher to get the required sample of 50 farmers (30 small scale farmers and 20 large scale farmers per division), thus making a total of 150 farmers under the subsidy programme from the three Divisions. The details on the distribution of samples per division are shown in table 1.

Table 1: Distribution of Sample Size by Districts and Divisions under Fertilizer Subsidy Programme

Name of Division	**Sample Population of farmers in each Category**		
	Small Scale	**Large Scale**	**Total**
Kwanza Division	**30**	**20**	**50**
Kiminini Division	**30**	**20**	**50**
Kaplamai Division	**30**	**20**	**50**
Total	90	60	150

3.5.2 Sampling Procedure for NAAIAP Programme.

On the other hand, among the 300 farmers who were supported by the NAAIAP programme, 30 farmers (10%) were selected through simple random sampling from a list of beneficiaries

(100 per Division) given by extension officers in each of the three Divisions. A final sample was selected where every tenth farmer in each Division was picked from a list of 100 to get the required sample of 10 beneficiaries from each division. This gave a total of 30 farmers from all the three divisions of Kwanza, Kaplamai and Kiminini as shown in Table 2. According to Kathuri and Pals (1993) the minimum sample for survey type of research should be 20-50 for each minor sub-group. In Trans- Nzoia west the study covered Kiminini Division while in Kwanza and Trans-Nzoia East Districts the study covered Kwanza and Kaplamai Divisions respectively. The divisions were selected because maize does well there and so this was expected to give results that could be generalized to other areas.

Table 2: Distribution of Sample Size by Districts and Divisions under NAAIAP Programme

Name of District and Division	Sample Population of farmers Per Division
Kwanza District(Kwanza Division)	10
Trans-Nzoia West District (Kiminini Division	10
Trans-Nzoia East District (Kaplamai Division)	10
Total	**30**

3.6 Instrumentation

In this study two types of questionnaires were used to collect data from the farmers. One type of questionnaire (Appendix A) was for the farmers who got farm inputs through NAAIAP programme and the other type (Appendix B) was for farmers who acquired subsidized fertilizer through NCPB. The questionnaires had both closed and open-ended questions where applicable. The questionnaire for farmers who got farm inputs through NAAIAP programme was used to collect data on respondent characteristics, socio-economic issues and information on the fertilizer acquired through the programme. The information included farmers' age, marital status and level of education. The socio-economic issues included the sector of employment, size of land and the acres of land for the first 5 enterprises. The data gathered under the NAAIAP programme included the number of bags used before and after the programme, the acres and yields achieved before and after the programme.

Questionnaire for farmers who accessed the subsidized fertilizer also had questions concerning characteristics of individual farmers, socio-economic issues and data on fertilizer acquired from NCPB and the challenges associated with the programme. Under this Subsidy Programme the respondents were asked about the time period it took them to access the subsidized fertilizer, if there were cases of inefficiency and the records of fertilizer purchased before and after the subsidy programme as well as the acreages and yield achieved before and after the programme.

The instrument was used because it was free from the bias of the interviewer since the respondents are normally able to give some information in their own words and the respondents can have adequate time to give well thought answers (Kothari, 2004). The data collected was examined for completeness, comprehensibility and consistency.

3.6.1 Validity

In order to improve on the validity of the instruments, Egerton university academic staff who are experts in agricultural extension, supervisors and colleagues read through the instruments for correct wording and their contents. This was meant to address the aspect of content validity to ensure that there was adequate representativeness of the items on the instrument as relate to what was intended to be measured. According to Kathuri and Pals (1993), content validity cannot be represented numerically, but is determined subjectively by a thorough examination of the instrument. The comments from the experts were used to modify the instruments before pilot testing. Each item was analyzed to improve on the weak areas that had been noted so as to give valid data that could be relied on.

3.6.2 Reliability

To test for reliability, a pilot test was done in Uasin- Gishu County in Eldoret West District which has a similar agro ecological zone, farmer category, and where the input supply support programmes had been on-going. Thirty (30) maize farmers with similar characteristics were selected to assist in the exercise. The questionnaires were then administered and analysis of the data carried out to calculate the Cronbach's coefficient Alpha to determine how items correlated among themselves. A reliability coefficient (α) of 0.83 was achieved; this was above the threshold of 0.70 which is acceptable for social research. Cronbach's alpha was preferred because it is a statistic which is generally used as a measure of internal consistency or reliability of a psychometric instrument (Choudhury, 2010).

3.7 Data Collection Procedure

Before data collection, authority was obtained from Graduate School of Egerton University; thereafter a permit was obtained from National Council for Science and Technology. Further assistance was obtained from local provincial administration and extension officers within the study area. The farmers were consulted and an agreement was reached on when and where to meet with them for data collection.

During the meetings, the researcher gave clear instructions before allowing the respondents to fill the questionnaires.

3.8 Data Analysis

After data collection, the data was edited, coded, classified and tabulated for easy analysis. Both descriptive and inferential statistics was used in analyzing the data. Descriptive statistics assisted in showing size and shape of distributions along with the relationships between two or more variables. Data were summarized using frequencies and percentages while inferential statistics assisted in testing hypotheses in order to determine the effects of independent variable on the dependent variables. Statistical package for the social sciences (SPSS) software was used to organize the data along the statistical tests for the study. The paired t-test was used for testing hypotheses, since paired t- test was appropriate for comparing the results of two related samples. In this case for instance, the achievements in acres, yields and inputs used were compared before and after the fertilizer supply support programmes. The null hypotheses were tested at 0.05 significance level. Table 3 gives a summary for data analysis of the hypotheses.

Table 3: Summary Table for Data Analysis

Hypotheses	**Independent Variable**	**Dependant Variable**	**Method of analysis**
$H_{01:}$ There is no statistically significant difference between quantities of fertilizers acquired before and after fertilizer supply support programmes for maize production by farmers in Trans-Nzoia County.	Increase in levels of fertilizer use	Quantity of fertilizer acquired for maize production	Paired t-test
H_{02}: There is no statistically significant difference between acreages achieved at farm level before and after fertilizer supply support programmes under maize production in Trans-Nzoia County.	Increase in levels of fertilizer use	Overall changes in acreages under maize at farm level.	Paired *t*-test
H_{03}: There is no statistically significant difference between yields achieved per acre before and after fertilizer supply support programmes under maize production in Trans-Nzoia County.	Increase in levels of fertilizer use	Changes in maize yields	Paired *t*-test

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study based on the objectives related to the two input supply support programmes (NAAIAP and Fertilizer Subsidy). The issues analyzed and discussed include the challenges in provision of subsidized fertilizers, the difference in the amount of fertilizer used per farm, acreages and yields achieved per acre before and after the two input supply support programmes.

4.2 Profiles of the Respondents

The farmers who were involved in the two programmes were interviewed on issues relating to their socio economic backgrounds that were considered to have a relationship with the programmes. Areas they were interviewed in included their ages, gender, level of education and sectors of employment. The results from the above issues are briefly discussed below;

4.2.1 Age

4.2.1.1 Age Category of Farmers under Fertilizer Subsidy Programme

The respondents were asked to indicate the age category they belonged to. This was intended to establish the age category that was more involved in farming. The results are presented in Table 4.

Table 4: Age Category Distribution of Farmers under Subsidy Programme

Age Category	Frequency	Percentage
Less than 20 Years	1	1
20-39 Years	35	23
40-59 Years	73	49
60-79 Years	40	26
80 years and above	1	1
Total	**150**	**100**

Results shown in Table 4, reveal that majority of the farmers were in the age category of 40-59 years (49%) while very few were in the first age category of less than 20 years and last age category of 80 years and above. This may mean that most active farmers in the community were within the age category of 40-59 whereas only 1 respondent among the farmers was in the youth full age. This concurs with the findings of Olanyi and Adewale (2012), who in their study in maize production among rural youth in Nigeria, found out that the middle aged people were more involved in agricultural activities than very young people. The age factor is important because farming needs maturity, access to income and possession of physical energy, factors which are found mostly among the middle aged people

4.2.1.2 Age Category of Farmers under NAAIAP Programme

The age category of farmers under NAAIAP programme was sought to find out how the programme targeted different age categories in the community and to find out further which category benefitted most. The results are presented in Table 5.

Table 5: Age Category Distribution of NAAIAP Farmers

Age Category	**Frequency.**	**Percentage**
Less than 20 Years	0	0
20-39 Years	3	10
40-59 Years	24	80
60-79 Years	3	10
80 years and above	0	0
Total	**30**	**100**

The results obtained showed that there were no farmers who were below 20 years and those who were above 80 years, and that most farmers fell in the age bracket of 40-59 years (80%). Farmers who were 60-79 years were only 10 percent of the respondents, the same as in the age bracket of 20-39 years. The programme was targeting vulnerable farmers who owned land and had families and could not afford farm inputs. This explains why most respondents were in the age category of 40-59 years (80%).

4.2.2 Farmers Gender Distribution

4.2.2.1 Gender Distribution of Farmers under Fertilizer subsidy Programme

The gender distribution in the programme was established to find out which gender was actively involved in farming. The assumption was that the higher the percentage of a certain gender the more actively involved that particular gender was to be in farming. The results are presented in Figure 4.

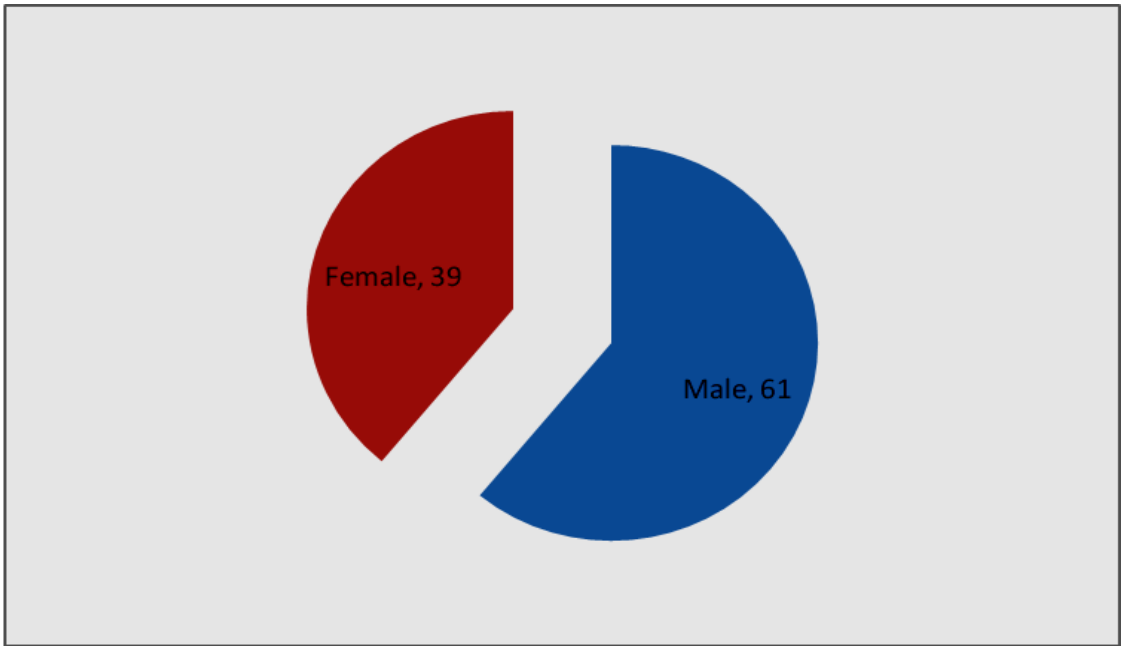

Figure 3: **Gender Distribution of Farmers under Fertilizer Subsidy Programme**

Figure 4 shows that the majority of the farmers were male (61%) while females were 39 percent of the respondents. This may be attributed to gender roles in the community which allow men to do a lot of work in the farm while women do some light duties except in cases where a woman is a widow or single. This could also have been due to the fact that very few women owned resources like land and so were not actively involved in farming.

This finding concurs with that of Gwary, Kwaghe, and Jaafar-furo. (2011), who found that males constituted the highest percentage (55%) than their female counterparts (45%) in agricultural production in a study done in Michika area of Adamawa state of Nigeria.

4.2.2.2 Gender Distribution of Farmers under NAAIAP Programme

The information on gender under NAAIAP programme was also gathered for the purposes of knowing which gender benefitted most. The results are shown in Table 6

Table 6: Gender Distribution of Farmers under NAAIAP Programme

Gender Type	Frequency	Percentage
Male	5	17
Female	25	83
Total	**30**	**100**

It was found that there were more females (83%) than males (17%) as shown in Table 6. This can be attributed to the fact that the NAAIAP programme had targeted the vulnerable members of the community and women were the majority under this criteria.

4.2.3 Level of Education

The information on the level of education of the respondents was gathered to find out if there was any relationship between the level of education and the level of involvement of farmers in maize production. Education is important because it is expected that the more educated a farmer is, the more informed the farmer can be in terms of the supports offered by the government in the agricultural sector that could enable the farmer to participate more in agriculture. There is also a likelihood of an educated farmer having more access to other sources of income that can boost his/her participation in farming. Farmers were asked to indicate their levels of education which was divided into four categories such as none for those who did not have even basic education, secondary, and college or university education. The results are shown in Figure 5.

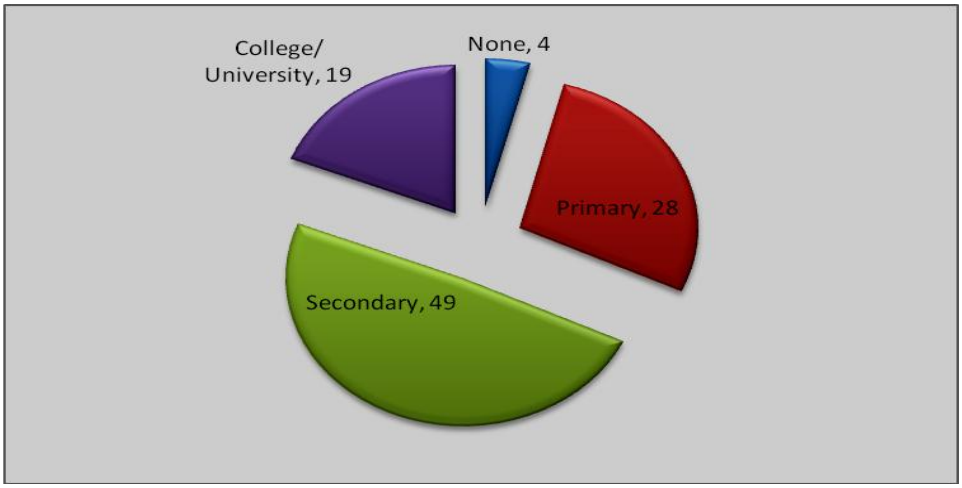

Figure 4: **Level of Education Among Farmers under Subsidy Programme.**

As shown in Figure 5, most of the respondents had secondary education (49%) followed by those with primary education (28%). Few farmers had college or university education (19%) and only 4 percent of the farmers had no education at all.

4.2.4 Source of Employment Other than Farming

Information on farmers' sources of employment was sought to be able to find out if there was any linkage between maize production, and other forms of employment. It was expected that those in other formal employments had little time to engage in farming unlike the ones who resided in the rural areas who took farming as their main activity and source of income. The results are shown in Figure 6.

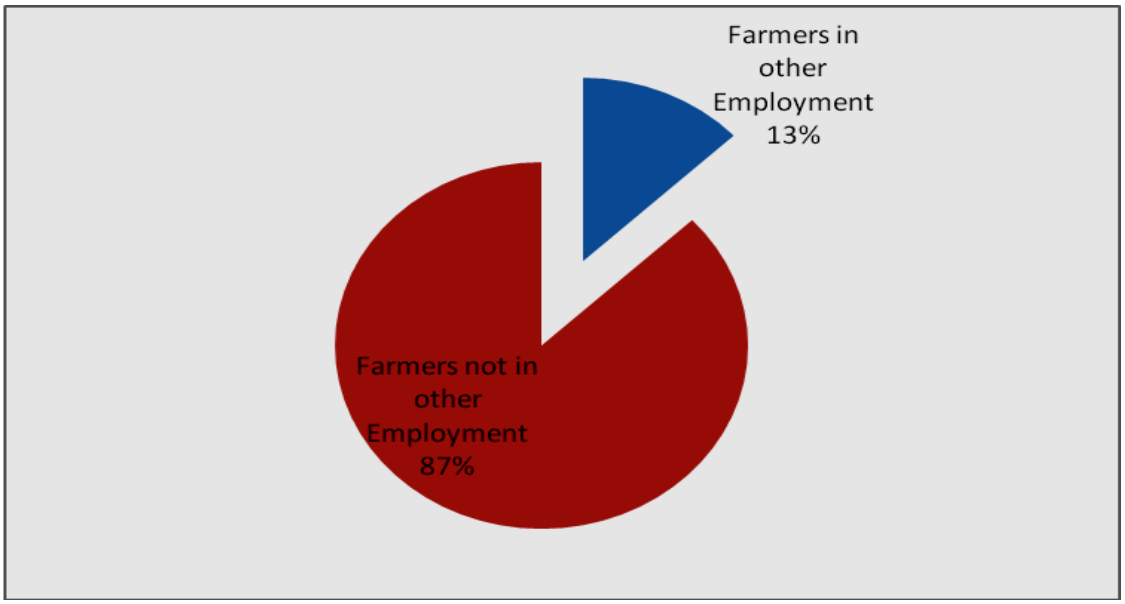

Figure 5: **Distribution of Respondents in the Formal and Informal Sector**

According to Figure 6, most of the farmers under the subsidy programme had no other employment apart from farming and only a few (13%) were employed in the other sectors such as education and in the civil service as well. This shows that most of the farmers depended on farming as their main source of income.

4.2.5 Land Size and Enterprise Distribution of Farmers under Subsidy Programme

The size of land owned and enterprise distribution by farmers were sought to establish the average land sizes and preferred enterprise in the study area.

Table 7: Statistics on Farm Sizes for farmers under Subsidy Programme

Statistic	Land Size in Acres
Mean	24.40
Mode	5.00
Std. Deviation	4.24
Range	339.00
Minimum	1.00
Maximum	340.00

The size of land owned by farmers ranged from 1- 340 acres with the total acreages for farmers under this study being 3721 acres (1488 Ha). Majority of the farmers owned 5 acres (2 Ha.) of land with a mean of 24 acres (9.6 Ha.) as presented in Table 7.

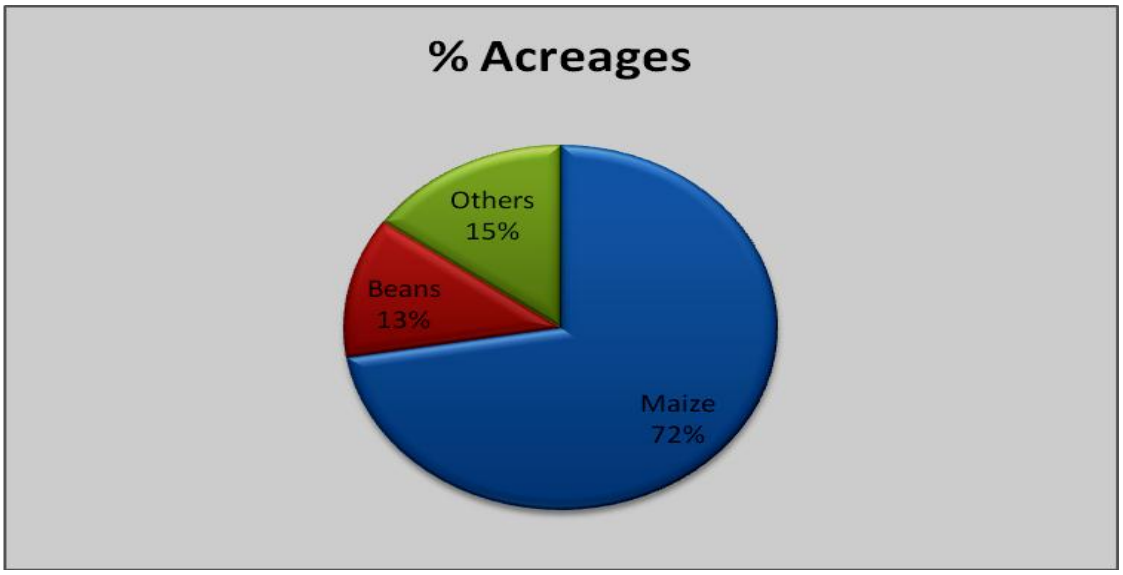

Figure 6: **Enterprise Distribution of Farmers under the Subsidy Programme.**

Figure 7 shows the enterprise distribution among the farmers interviewed. From the figure it can be observed that most land was under Maize at 72 percent followed by other enterprises like Livestock, vegetables, fruits, tubers and woodlots with beans on its own taking 13 percent of the land. This shows how important Maize and beans were to the community and so any intervention on food security needed to focus on the two enterprises.

4.3 Analysis of the Objectives

This section has focused on the analysis of the results obtained in relation to the four objectives, research question and the hypotheses.

4.3.1 Challenges of provision of subsidized fertilizers

The first objective sought to investigate the challenges faced in the provision of subsidized fertilizers in Trans-Nzoia County. This objective was based on the fact that despite the anticipated success in the implementation of the programme there were still complaints from the farmers about the accessibility to the subsidized fertilizer and the existence of some other challenges such as inefficiency, some forms of malpractices and untimely delivery of the subsidized fertilizers at NCPB depots.

4.3.1.1 Inefficiency in the Disbursement of Fertilizer in the Subsidy Programme

Farmers were asked to indicate on average how long it took them to access the subsidized fertilizer from the NCPB's store in order to get the period it took to access the inputs.

This was necessary since most farmers had complained that it is difficult to access the subsidized fertilizer in time.

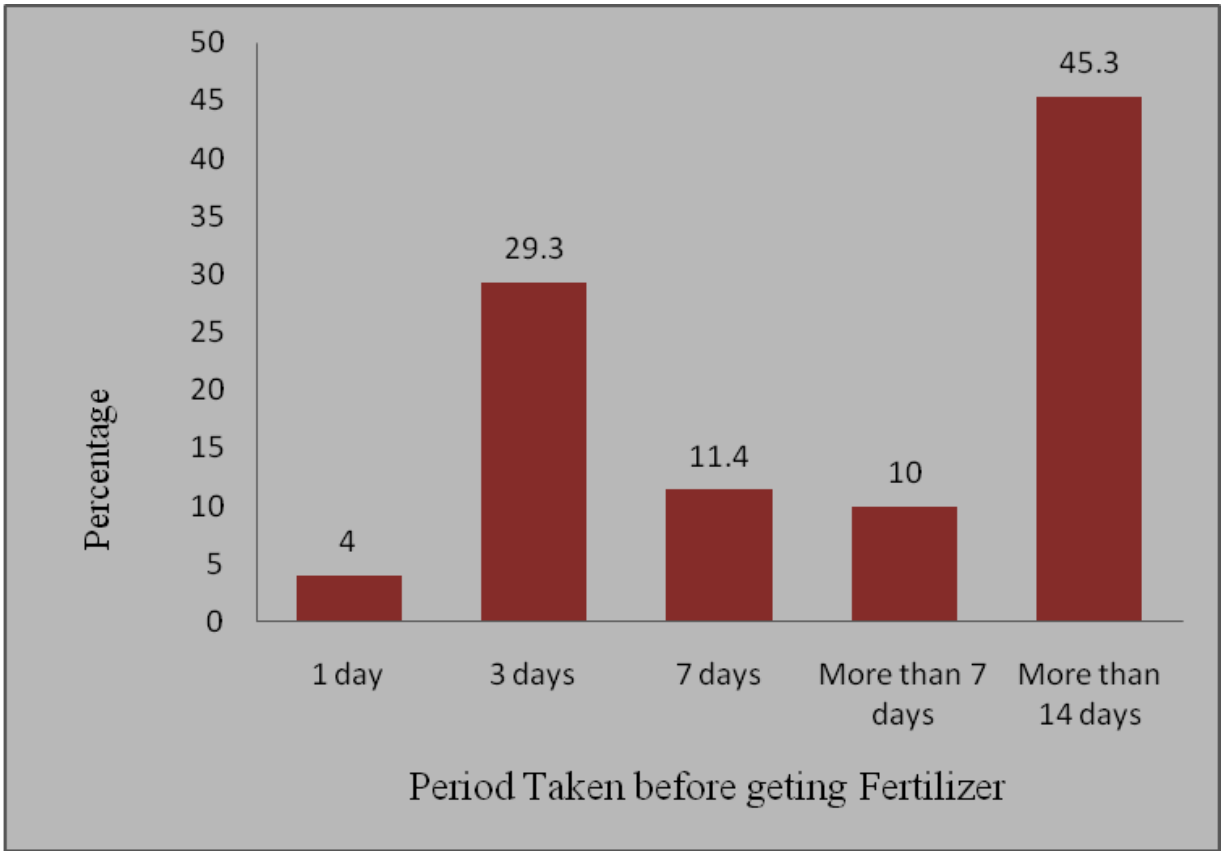

Figure 7: **Period Taken by Farmers before Accessing Subsidized Fertilizer**

The results shown in Figure 8 illustrate that majority of the farmers(45%), took more than two weeks and very few farmers(4%), got the fertilizer within one day. This shows that the process of acquiring fertilizer was cumbersome and was not fast enough as was expected and this could lead to delay in planting especially when the fertilizer arrived late in the season at NCPB depots.

There were also some conditions that farmers had to meet with the agricultural extension and NCPB offices before acquiring the fertilizer. Some of these conditions included getting a recommendation from the Ministry of Agriculture's staff and the requirement that a farmer pays the money to the bank first, which made the process to become too bureaucratic.

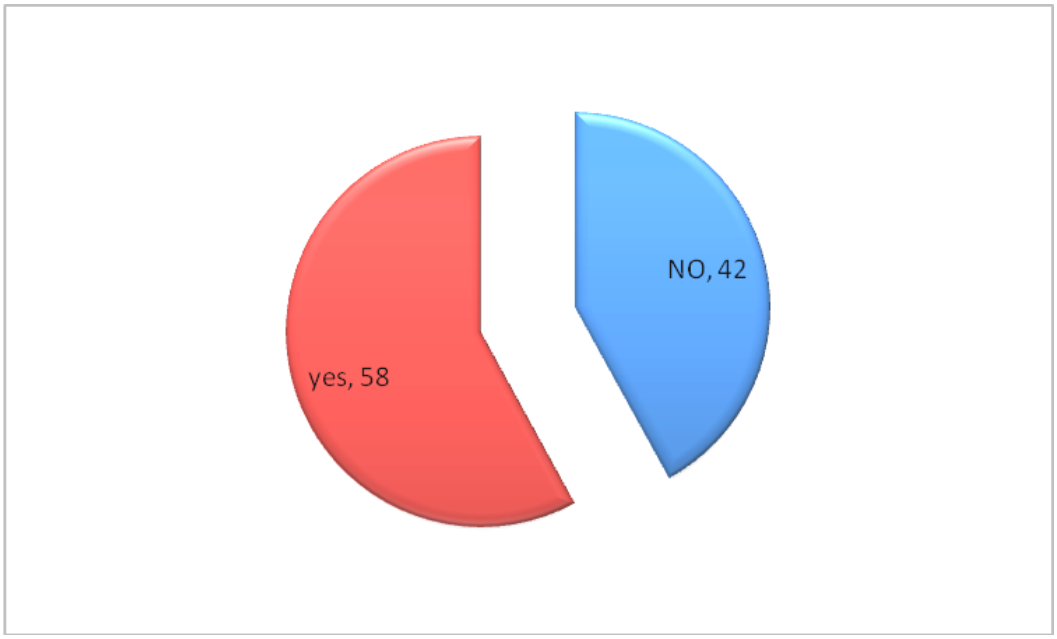

Figure 8: **Existence of Inefficiency in the Fertilizer Subsidy Programme.**

When the farmers were asked to give their views on whether the process of acquiring the subsidized fertilizers was efficient by indicating 'yes' or 'no', most farmers (58%) indicated that there was a lot of inefficiency. On the other hand 42 percent indicated that there was not much inefficiency in the process. The slight difference can be attributed to the fact that some farmers acquired the fertilizer early before the season started and so did not experience delays as compared to those who went for the input when the demand was high. It was also important to establish where within the fertilizer supply chain there was a lot of inefficiency. This was done by asking the respondents to indicate where they encountered a lot of inefficiency and the results are shown in Table 8.

Table 8: Farmers' Rating of Institutions on Inefficiency under Subsidy Programme

Institution	No. of Farmers who experienced inefficiency in the Institution	Percentage of farmers who experienced inefficiency in the Institution
Ministry of Agriculture	3	2
All the Institutions	7	5
None	64	42
NCPB	76	51
Total	150	100

Table 8 shows that only 2 percent of the farmers experienced inefficiency at the Ministry of Agriculture's offices alone. More than a half of the farmers (51%) experienced this at the NCPB alone while 42 percent did not feel that there was inefficiency in the fertilizer acquisition process. On the other hand 5 percent experienced delays in all the two offices.

4.3.1.2 Other Challenges in the Subsidized Fertilizer Programme

The study also investigated if the subsidy programme had challenges in terms of corruption cases, whether small scale farmers benefited from the programme and timely delivery of the fertilizer to farmers. A Likert scale consisting of statements which were either favourable or unfavourable towards certain issues was presented to the respondents in order to obtain responses.

The statements which were on the Likert scale were assigned scores as follows; Strongly disagree, 1, Disagree 2 , Not sure 3 , Agree 4 and Strongly agree 5. The total level of evaluation per issue was then compiled from all the 150 farmers who were under the subsidy programme to establish how each statement was scored. The higher score a statement had the more the issue was approved, the maximum score being 750 i.e., 5 times 150 farmers. For example if all the farmers simply agreed with the statement then the total score would be 4 multiplied by 150, giving 600 (80%) out of 750 (100%). The results of these evaluations are shown in Table 9.

Table 9: The Challenges Associated with Provision of Subsidized Fertilizer

Opinion Statement/Issue	Frequency	Percentage Score
Subsidy has Cases of corruption	734	97.8
Small Scale Farmers are Disadvantaged	375	50
Untimely availability	734	97.8
Expected Total Max. Score per statement.	750	100

The results obtained in Table 9 show that there was a concurrence of 97.8 percent that there were cases of corruption in the fertilizer acquisition. These cases include bribery and the

selling of the subsidized fertilizer to the private stockists who later on hiked the prices in their shops. Even though the programme was meant to benefit the small scale farmers, results in Table 9 also indicate that there was a 50 percent rating that the programme did not benefit small scale farmers as was intended but large scale farmers instead.

Timely delivery of fertilizer is very important because farmers need fertilizer early in the season as they prepare to plant. This has been a challenge in the implementation of the subsidy programme and so it was important to find out the opinion of the respondents as concerns this. According to results presented in Table 9, most of the farmers strongly felt that the fertilizer was supposed to be availed early in the season so that they could purchase it early, thus scoring 97.8 percent.

4.3.2 Difference in Quantities of Fertilizers Acquired by farmers before and after programmes

The second objective was to investigate the difference in quantities of fertilizer acquired by maize farmers before and after farm input supply support programmes in Trans-Nzoia County. The input supply support programmes being the Fertilizer subsidy programme and the NAAIAP programme. The two programmes were handled differently and the results are presented separately.

4.3.2.1 Difference in Quantities of Fertilizers Acquired under Subsidy Programme

The researcher investigated the effect of subsidy programme on the use of fertilizer since the fertilizer prices were low and this could have led to some increase in the amount of fertilizer acquired by the farmers. The results are shown in Table 10.

Table 10: Fertilizer Levels in 50 Kg Bags Acquired for Maize Production before and after Subsidy Programme

Total Fertilizer Use	N	Mean	Mode	Min	Max.	Std. Dev.
Before Subsidy	150	37.52	2	1	800	9.02
After Subsidy	150	68.23	4	3	1350	1.469

Results in Table 10 show that farmers were able to buy more fertilizer after the introduction of the subsidy programme. The results show that the mean amount of fertilizer improved from 37.52 bags to 68.23 bags and at the same time minimum number of bags used increased from 1 bag before the subsidy programme to 3 bags after the programme. On the other hand farmers used a maximum of 800 bags of fertilizer before the subsidy programme but after the

subsidy Programme this increased to a maximum of 1350 bags, which was quite a significant increase.

4.3.2.2 Difference in Quantities of Fertilizers Acquired under NAAIAP Programme

Under the NAAIAP programme, the amount of planting fertilizer (DAP) was added to the amount of topdressing fertilizer (CAN) to get the total sum of fertilizer used per family and this was to create different categories of total fertilizer used before and after the NAAIAP programme per farm as shown in Table 11.

Table 11: Total Base and Top-dressing Fertilizer Used before and after NAAIAP

Category sum of DAP and CAN per farm (Bags)	**Number and Percentage of farmers Before NAAIAP Programme**		**Number and Percentage of farmers After NAAIAP Programme**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
1-2	24	80	4	14
3-4	5	17	17	57
5-6	0	0	7	23
7-8	1	3	1	3
More than 8	0	0	1	3
Total	**30**	**100**	**30**	**100**

From Table 11 it can be observed that before NAAIAP programme 80 percent of the farmers used between 1 and 2 bags of fertilizer with only 17 percent using between 3 and 4 bags of fertilizer per farm. But after the NAAIAP programme the use of fertilizer improved as can be noted, farmers who used between 3 and 4 bags improved from 17 percent to 57 percent.

4.3.3. Difference in Acreages Achieved at Farm Level before and after the Programmes

4.3.3.1 Difference in Acreages Achieved under Subsidy Programme

Fertilizer Subsidy Programme was expected to encourage farmers to increase the acreages under maize production because of the low cost of production that would result from the

reduced fertilizer prices. This was investigated by computing the acreages under maize production per farmer before and after the farmer had accessed the subsidized fertilizer. The information was analyzed and presented in Table 12.

Table 12: Acres under Maize Achieved before and after Subsidy Programme

Maize In Acreages	N	Mean	Mode	Min	Max.	Std. Deviation
Before Subsidy	150	14.2977	2	0.75	200	2.69
After Subsidy	150	18.4873	2	0.80	300	3.65

After the introduction of the Subsidy Programme, the acreages achieved by farmers considerably increased. Table 12 shows that the mean acreage under maize increased from 14.29 before the subsidy programme to 18.48 acres after the subsidy programme. Even though there was little change in minimum acreages (0.75 and 0.8 Acres), there was a difference in maximum acres achieved from 200 to 300 bags. This shows that the fertilizer subsidy programme possibly led to the above changes. This can be attributed to the reduced cost of production that could have enabled the farmers to transfer the saved capital to plant more acres under maize production**.**

4.3.3.2 Difference in Acreages Achieved under NAAIAP Programme

It was also investigated if there was an increase in acreages among the farmers who were supported under the NAAIAP programme. This was done by getting the acreages before the programme and the acreages achieved by the farmers after the programme. The data was analysed and the results presented in Table 13.

Table 13: Acres of Maize before and after NAAIAP Programme

Category of acres of Maize achieved by farmers under NAAIAP programme.	Number and approximate Percentage of farmers Before NAAIAP Programme		Number and approximate Percentage of farmers After NAAIAP Programme	
	Frequency	**Percentage**	**Frequency**	**Percentage**
< 1	1	3	2	7
1-2	27	91	25	83
2 >3	1	3	1	3
3-4	1	3	2	7
Total	**30**	**100**	**30**	**100**

The acres under maize before the NAAIAP programme were insignificantly different from the ones after the NAAIAP programme as presented in Tables 13. The change in acreages after the programme was quite minimal as can be seen in the case of percentage of farmers who had between 1 and 2 acres before the programme (91%) and percentage of farmers after the programme (83%). It can also be seen that the number of farmers who achieved between 2 and 3 acres of maize remained the same before and after the programme. This can be attributed to the fact that the beneficiaries of the programme were resource poor and did not have enough land and income for further expansion.

4.3.4. Difference in Yields Achieved Per Acre before and after the Programmes.

It was also important to establish if the two programmes brought some difference in yields among farmers after their implementation. The analysis of the findings are presented and explained below.

4.3.4.1 Difference in Yields Achieved Per Acre under Subsidy Programme

The fertilizer subsidy programme was expected to bring some change in the yields achieved by farmers because it was expected that farmers were going to use more fertilizers per acre that would lead to an increase in productivity. The results are presented in Table 14.

Table 14: Maize Yields Achieved before and after Subsidy Programme

Maize Yields in Bags/ Acre	N	Mean	Min	Max.	Std. Deviation
Before Subsidy	150	15.10	5	30	4.43
After Subsidy	150	23.08	10	32	4.29

There was an increase in yields achieved after the subsidy programme as shown in Table 14, where the mean yields per acre increased from 15.10 to 23.08 bags per acre after the programme. The minimum bags harvested per acre before and after the subsidy programme also went increased from 5 to 10 bags while the maximum bags harvested per acre also increased from 30 to 32 bags per acre.

This increase could have been as a result of farmers buying adequate quantities of fertilizer because of the subsidy thus transforming this gain into production of more bags as a result of improved fertilizer application.

4.3.4.2 Difference in Yields Achieved Per Acre under NAAIAP Programme.

The programme was expected to bring a change in the number of bags harvested per acre because of the use of adequate amount of fertilizer after the support from the programme. The results are presented in Table 15.

Table 15: Maize Yields per Acre before and after NAAIAP Programme

Categories of Maize Yields in Bags Per Acre before and after NAAIAP Programme .	Number and approximate percentage of farmers before NAAIAP Programme		Number and approximate Percentage of farmers after NAAIAP Programme	
	Frequency	**Percentage**	**Frequency**	**Percentage**
3-4	1	3	0	0
5-6	7	23	0	0
7-8	9	30	0	0
9-10	6	20	5	17
11-12	5	17	2	7
13-14	2	7	1	3
15-16	0	0	8	27
17-18	0	0	1	3
19-20	0	0	6	20
21-22	0	0	4	13
23-24	0	0	2	7
25-26	0	0	1	3
Total	**30**	**100**	**30**	**100**

The number of 90 kg bags harvested before and after the NAAIAP programme was compared in respective categories as shown in Tables 15 and the results show that there was a positive increase in yields after the NAAIAP Programme. For instance, before the programme no farmer had achieved more than 14 bags but after the programme a total of 73 percent of the farmers got 15 bags and above. This shows that the programme enabled farmers to get more yields in the subsequent seasons.

4.4 Test of Hypotheses

The research study had three hypotheses that were derived from objectives ii, iii and iv. The hypotheses were tested separately for the two programmes, the Fertilizer Subsidy and NAAIAP Programmes as presented below.

4.4.1 Test of Hypothesis One

4.4.1.1 Change in Quantities of Fertilizer use under the Subsidy Programme

Hypothesis 1: "There is no statistically significant difference between quantities of fertilizers acquired before and after farm input supply support programmes for maize production by farmers in Trans-Nzoia County."

The hypothesis was tested using paired t- test where the total amount of fertilizer package of basal and top dressing fertilizer used before and after subsidy programme was computed per farmer. This was done in order to get the total number of 50 kg bags of fertilizer used per farmer before and after the programme. The hypothesis was tested to establish if there was any significant difference between quantities of fertilizer used by farmers before and after subsidy programme. The results are presented in Table 16.

Table 16: Paired t- test Results of Analysis of Fertilizer Acquired under Subsidy Programme

Total Fertilizer use per farm	Mean	N	Std. Deviation	*t*-Value	df	P- Value
Before Subsidy	37.526	150	9.02743	5.156	149	0.001
After Subsidy	68.233	150	1.46976			

The results in Table 16 from the Fertilizer Subsidy Programme show that there was an increase in the mean use of fertilizer after the programme from 37.5 kg to 68 23. The computed P- value was 0.001 which was far much less than the level of significance set at $\alpha=0.05$ ($p<0.05$), and so the null hypothesis was rejected and it was concluded that there was statistically significant difference between quantities of fertilizer acquired before and after subsidy programme in maize production by farmers in Trans-Nzoia County.

This result conforms with the findings of Ebong, (2009), who also found out the same relationship. In their study on Demand for Fertilizer Technology by Smallholder Crop Farmers for Sustainable Agricultural Development in Akwa Ibom State in Nigeria, they found that Fertilizer subsidies increase the demand for fertilizer in crop production. This also conforms with the law of demand which states that, as the price of a commodity decreases the demand for it increases.

4.4.1.2 Change in Quantities of Fertilizer use under NAAIAP Programme

Under NAAIAP programme it was necessary to establish if the programme would change the attitude of farmers concerning the use of fertilizer and encourage them to apply more fertilizer in their farms after the programme.

Table 17: Paired *t* - test Results of Analysis of Fertilizer Acquired under NAAIAP Programme

Total basal and top dressing fertilizer acquired.	Mean	N	Std. Deviation	*t*-Value	df	P-Value
Before NAAIAP	2.2333	30	1.38174	-7.471	29	0.001
After NAAIAP	4.3500	30	2.61676			

The results shown in Table 17 indicate that there was an increase in the average use of fertilizer after the programme. Since the computed p- value (0.001) from the paired t- test was less than the level of significance set at $\alpha=0.05$ ($p<0.05$), the null hypothesis was rejected and a conclusion was drawn that there was statistically significant difference between quantities of fertilizers acquired before and after the farm input supply support programme (NAAIAP) for maize production by farmers in Trans-Nzoia County. This was possible because the income realized from the programme could have enabled the farmers to acquire more fertilizers to use in their farms. When the mean quantities of fertilizers used before and after the two support programmes were compared it was found that the fertilizer use under the Subsidy Prgramme among the farmers increased from 37.52 to 68.23 bags, which was an increase of 83 percent. In the case of NAAIAP programme, the fertilizer use increased from 2.2 to 4.3 bags which was 100 percent. This shows that NAAIAP programme could lead to more impact as compared to the Subsidy Programme in terms of increase in fertilizer use.

This also concurs with the study done by Muendo (2012) on the influence of fertilizer subsidy on the production of maize in Transmara who found out that subsidy of fertilizer positively influence to a greater extent maize production.

4.4.2 Test of Hypothesis Two

Hypothesis 2 was derived from objective 3 and was tested to establish if there was any significant change in acreages that might have been brought by the two input supply support programmes. The fertilizer subsidy and NAAIAP programmes were expected to have effect on the number of acres achieved by maize farmers after their implementations. The results are presented separately below for each of the programmes

Hypothesis 2; "There is no statistically significant difference between acreages achieved at farm level before and after farm input supply support programmes under maize production in Trans-Nzoia County".

4.4.2.1 Change in Acres Achieved under the Subsidy Programme

The hypothesis was tested to determine if there was any significance in the difference between acreages achieved before and after subsidy programme among maize farmers in Trans-Nzoia County. Results are presented in Table 18

Table 18: Paired *t* - test Results of Analysis of Acres Achieved by Farmers before and after Subsidy Programme

Maize acreage	Mean	N	Std. Deviation	*t*-Value	df	P- Value
Before Subsidy	14.297	150	2.696847	-3.867	149	0.001
After Subsidy	18.487	150	3.656525			

Table 18 shows that the computed p- value (0.001) was less than the set value of α=0.05 and so the null hypothesis was rejected and a conclusion was made that there was statistically significant difference between acreages achieved at farm level before and after the Fertilizer Subsidy Programme in maize production in Trans-Nzoia County.

Fertilizer subsidy reduced the cost of production and so farmers could have made more profits which enabled them to cultivate more acreages under maize. The finding of this study concurs with the findings of Nyagito and Ndirangu (1997), who found that there is a direct relationship between profitability and acreages under maize production.

4.4.2.2 Change in Acres Achieved under the NAAIAP Programme

The acres achieved by the respondents before and after the NAAIAP programme were analyzed to find out if there was an increase in acres among the farmers which might have been caused by the programme. The results are presented in Table 19.

Table 19: Paired *t* -test Results of Analysis of Acres before and after NAAIAP Programme.

Maize acreages	Mean	N	Std. Deviation	*t*-Value	df	P-Value
Before NAAIAP	1.4417	30	.68205	-7.471	29	.058
After NAAIAP	1.5750	30	.74101			

The results as presented in Table 19, show that there was insignificant change in acres achieved after the programme. The computed p-value (0.058) was greater than the level of significance set at $\alpha=0.05$, ($p<0.05$), since the computed p-value was 0.058 and so the null hypothesis was accepted and a conclusion made that there was no statistically significant difference between acreages achieved at farm level before and after the NAAIAP programme under maize production in Trans-Nzoia County. This can be attributed to the fact that the farmers who were supported by the programme were resource poor and they did not have enough land at their disposal for further expansion.

When the increase in acres after the two programmes were compared, it showed that there was a marked increase in the mean acres in the Subsidy Programme from 14 to 18 acres (28.5 %) as shown in Table 18, as compared to a small increase in acres in the NAAIAP Programme (7%). This showed that the Subsidy Programme could result in achievement of more acreages under maize production than the NAAIAP programme.

4.4.3 Test of Hypothesis Three

Hypothesis 3 "There is no statistically significant difference between yields achieved per acre before and after farm input supply support programmes under maize production in Trans-Nzoia County"

4.4.3.1 Change in Yields Obtained under Subsidy Programme

Hypothesis three was tested by comparing the yields per acre achieved by Maize farmers before and after the subsidy programme with the use of paired t-test, the results are presented in Table 20.

Table 20: Paired *t* - test Results of Analysis of Maize yields Achieved per Acre under Subsidy Programme

Maize Yields per acre	Mean	N	Std. Deviation	*t*-Value	df	P- Value
Before Subsidy	15.10	150	4.43067	-28.178	149	0.001
After Subsidy	23.086	150	4.29911			

In Table 20, the Computed P- value of 0.001 was less than the set value of $\alpha = 0.05$ in this study and so the hypothesis was rejected and it is concluded that there was statistically significant difference between yields achieved per acre before and after subsidy programme under maize production in Trans-Nzoia County. This was further supported by the fact that the mean yields per acre increased from 15.10 bags before the programme to 23.08 bags after the subsidy programme.

This finding concurs with the results found by Denning, Kabambe, Sanchez, Malik, and Flor, (2009) who found that there was a large increment in production of maize as a result of subsidy beyond the effect of better rainfall in Malawi. This finding also concurs with Ministry of Agriculture's economic review report (2012), which showed that there was an increase in maize production because of easy access to fertilizer as a result of subsidy. This was quite evident in Nyanza, Western, and Central provinces where the total maize production increased by 16 percent, 13 percent and 22 percent respectively, (GOK , 2012).

4.4.3.2 Change in Yields Obtained under NAAIAP Programme

It was also expected that after the farmers had implemented the NAAIAP programme, they would be able to realize the importance of using adequate fertilizer in their farms to get more

yields. So there was need to establish if the farmers actually got more yields after the programme. The results are presented in Table 21.

Table 21: Paired *t* - test Results of Analysis of Maize Yields Achieved Per Acre before and after NAAIAP Programme.

Maize yields per acre	Mean	N	Std. Deviation	t-value	df	P- Value
Before NAAIAP	13.0333	30	2.8136	-14.587	29	0.001
After NAAIAP	27.5000	30	4.596			

Under NAAIAP programme, (Table 21) there was a marked increase in the mean yields of maize per acre after the programme among the farmers since mean yields before and after the programme were 13.03 and 27.5 bags respectively. The results indicate that the computed p-value was 0.001. This was less than the set value of $\alpha = 0.05$ and so this was highly significant. Based on the findings, the hypothesis was rejected and a conclusion drawn that there was statistically significant difference between yields achieved per acre before and after NAAIAP programme under maize production in Trans-Nzoia County.

When the increase in yields in the two programmes were compared, it was found that there was more increase in mean yield under NAAIAP Programme (107%) as compared to the Subsidy Programme (35%). This shows that the NAAIAP Programme resulted in a more instant increase in yields than the Subsidy Programme.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of the study, its key findings, conclusions and recommendations based on the results. Suggestions for further research are also proposed.

5.1 Summary of the Study

In Trans-Nzoia County where maize is mainly grown as an income generating enterprise, the cost of production has been high due to the high cost of inputs, especially fertilizer. This has made some farmers to abandon the maize enterprise for other enterprises leading to food shortages of maize. The Kenya government had put in place programmes to motivate maize farmers to improve on maize production. These included the fertilizer subsidy programme (FSP) and the National Accelerated Agricultural Input Access Programme (NAAIAP) which provided resource poor farmers with farm inputs. This was taken as an intervention measure to encourage farmers to participate in maize production in order to increase maize production, alleviate frequent maize shortages and improve food security in the country. Despite all these, food situation surveys done by the Ministry of Agriculture indicate that the maize deficit is still high. This made it necessary to find out on the effects of these interventions on the participation of farmers in maize production in Trans-Nzoia County.

The study was designed as a cross sectional survey and was intended to investigate challenges in the provision of subsidized fertilizer, quantities of fertilizer acquired, acres achieved and yields obtained by farmers before and after the two programmes were put in place. A total of one hundred and eighty (180) farmers were involved in the study.

5.1.1 Profiles of the Respondents

Under the Subsidy Programme it was found that more men (61%) were involved in farming than women (39%) and the farmers' ages ranged from less than 20 years to over 80 years with majority falling under 40-59 years. It was also found that most of the farmers had acquired secondary education (49%) and only 4 percent had not acquired basic education with the rest having acquired primary or college/University education (47%).

Land sizes ranged from 1-340 acres with maize being the main enterprise (72%) followed by Beans (13%) and other smaller enterprises such as vegetables, fruits, livestock, tubers and woodlots put together occupying 15 percent of the land.

NAAIAP programme on the other hand focused on the small scale farmers who owned small parcels of land. Most of the beneficiaries were females (83%).

5.1.2 Challenges in the Provision of Subsidized Fertilizer

In relation to the challenges facing the provision of subsidized fertilizer, most farmers (58%) indicated that there was a lot of inefficiency in the programme. National Cereal and Produce Board (NCPB) was found to be the most inefficient institution in the Fertilizer Subsidy Programme where 50 percent of the farmers experienced a lot of inefficiency with the institution while acquiring the input as compared to only 2 percent with the Ministry of Agriculture's offices.

There were also cases of malpractices such as sale of the subsidized fertilizer to the private stockists who later on sold it in their shops at higher prices. It was also found that the small scale farmers did not benefit fully from the programme as was expected and the subsidized fertilizer was not delivered in time and in fact the bulk of it was brought when the planting season had already passed.

5.1.3 Effect of the Programmes on Farmers' Participation in Maize Production

It was established that the two programmes led to an increase in the amount of fertilizer used with the mean total fertilizer package per farm increasing from 37 to 68 bags per farmer under the subsidy programme and from 2.2 to 4.3 bags per farmer under the NAAIAP programme. The difference in fertilizer application before and after the programmes was statistically significant at 99 percent as compared to an earlier set value of 95 percent confidence level.

The results also showed that under the Subsidy Programme, there was a significant increase in acreages with the mean acres cultivated per increasing from 14 to 18 acres per farmer. But under the NAAIAP, there was no much change in acres. In relation to the yields, the two programmes led to an increase in yields per acre with mean yields in terms of 90 kg bag increasing under subsidy programme from 15 to 23 bags per acre and from 13 to 27 bags per acre under the NAAIAP.

5.2 Conclusions

Fertilizer subsidies have gained support as a policy tool to increase cereal crop production and more specifically in maize production. Most countries in Africa have adopted this strategy to increase their food security levels and to some extent to alleviate poverty among their rural households. Reports have indicated great success of fertilizer subsidy in Malawi (Melinda, Derek & Jayne (2011). Malawi for instance is now exporting maize to other neighbouring countries.

This study was to investigate the effects of fertilizer supply support programmes on farmers' participation in maize production in Trans-Nzoia County, Kenya. The results from the study indicate that fertilizer supply support programmes and in particular subsidy program had some challenges when it comes to the availability of the commodity in time and the period it takes for farmers to access the fertilizer. The result from the study indicates that 45 percent of the farmers got the subsidized fertilizer more than two weeks after application. This concurs with the study done by Muendo, (2012) in Transmara Kenya, who also found that the fertilizer subsidy programme had loopholes that hinder farmers from getting fertilizer in time.

This study has established that the small scale farmers got an equal opportunity to get access to the subsidized fertilizer just like the large scale farmers. However, the results from NAAIAP programme which was one of the fertilizer support programme in this study and targeted only resource poor farmers indicated that the support did not result in an increase in acreages in the subsequent season among these category of farmers. This can lead to a conclusion that the fertilizer subsidy that is meant to boost enormous maize production should target more of the large scale farmers at higher production levels

The results from this study also strongly suggest that the provision of fertilizer subsidy to farmers can enable them to realize the importance of inorganic fertilizer in crop production and can therefore encourage them to demand for more fertilizer in the subsequent seasons. The study has evidence that as a result of the fertilizer subsidy, mean fertilizer use increased from 37 bags to 68 bags per farmer. This shows that the fertilizer supply support programmes can increase the use of fertilizer at the farm levels. This in return will improve the soils and increase production.

On the other hand, the study established that subsidy can lead to an increase in the acreages under maize production. The study found out that the mean acreages increased from 14 acres

to 18 acres after the subsidy programme. However with the NAAIAP programme, there was an insignificant increase in acreages because these were resource poor farmers and did not have enough land at their disposal for further expansion. So if the goal of the subsidy programme is to increase production of maize, it is important to target most of the farmers at higher levels of maize production. These are farmers who have enough land and some resources and so can utilize the increase in income as a result of fertilizer subsidy to expand acreages under maize production.

The study also found out that there was a marked increase in maize yields from an average of 15 bags per acre before the fertilizer subsidy program to an average of 23 bags after the subsidy programme. These results concur with the study which was done by Rick-Gilbert & Jayne (2013) in Malawi that found that an additional kilogram of subsidized fertilizer boosts maize production by 2.76 kg. So this study generally concludes that fertilizer subsidy if well targeted and managed can increase maize yields thus boosting food security and income for maize farmers and in turn alleviate cases of food insecurity among the households.

5.3 Recommendations

From the study findings and conclusions, the following recommendations can be made;

(i) Measures can be taken is to establish additional fertilizer stores at every sub-county or wards if possible. This will help to reduce the period farmers take to access the input and also to reduce the number of people going for the input at one a particular NCPB facility.

(ii) The government can also allow well established farmer organizations such as Kenya federation of Agricultural Producers (KENFAP) to manage part of the programme in some areas. This can be done by allowing them to manage the subsidized fertilizer by being paid a commission in areas where the services of NCPB are not available.

(iv) Provision of subsidized fertilizer should be on continuous basis and not only at certain periods, this will help reduce the congestion during planting time.

(v) The government should continue with subsidy programmes because they can lead to an increase in acreages, use of fertilizer and yields since this will increase agricultural production and development in the agricultural sector leading to a quick growth in the economy.

5.4 Recommendations for Further Research

The researcher recommends further research in the following areas;

(i) To determine proper mechanisms for management and administration of subsidy programmes for the benefits of small scale farmers.

(ii) To determine the effect of fertilizer Subsidy Programmes on the prices of fertilizer among the private stockists in fertilizer supply chain.

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Appendix A

Questionnaire for Maize Farmers under NAAIAP Programme

Introduction

This questionnaire is meant to investigate the effect of farm input supply support programme (NAAIAP) on farmers' active participation in maize production in Trans-nzoia county. Please fill the questionnaire and submit at the agreed time, anything or item that is not clear can be clarified. All the information filled will not be used for any action against the interviewee and all the information will be treated as confidential and will be used only for the purposes of this survey.

PART A: Background and Socio-Economic Information About The Farmer

Instructions: Please fill the blank places provided with the information requested or tick where appropriate.

1 (a) District …….…… (b) Division ……

(c) Location……

(d) Date…….. (e) Mobile No……

Code:……..

2 (a) Farmers age bracket in years (Tick appropriately)

Less than 20 ☐ Between 20 and 39 ☐ Between 40 and 59 ☐

Between 60 and 79 ☐ 80 and above ☐

(b) Gender of the farmer (Tick where applicable)

Male ☐ Female ☐

(c) Marital status of farmer (Tick where applicable)

Single ☐ Married ☐

Divorced ☐ Widowed ☐

3. What is your level of education? (Tick where applicable)

None ☐ Secondary ☐

Primary ☐ College/University ☐

4. Are you in the formal employment? Yes ☐ NO ☐

If your answer is yes where do you work? .....

5. What is the size of your land in acres…….

6. Kindly indicate the acres for the first 5 enterprises (e.g. Maize, Beans, and Livestock etc) in your farm in the table below.

S. No	**Enterprise**	**Acres**
1		
2		
3		
4		
5		

PART B: Information on National Accelerated agricultural Input Access Programme (NAAIAP)

1. Did you benefit from National Accelerated Agricultural Input Access Programme (NAAIAP)?
   Yes ☐ NO. ☐

2. (a) How many bags of maize did you get from one acre of land under the NAAIAP Programme……

3. The issues in the table below concern the NAAIAP programme from which you benefited, please circle the number on the scale that you agree with according to your opinion or judgment. The rating scale is as explained below;

1 = strongly disagree (SD)

2 = Disagree (DA)

3 = Not sure (NS)

4 = Agree (AG)

5 = Strongly Agree (SA).

S. NO.	**ISSUES**	**SD**	**DA**	**NS**	**AG**	**SA**
1	NAAIAP Programme can encourage farmers to use the correct amount of fertilizer in maize farming.	1	2	3	4	5
2	The government should continue with the programme.	1	2	3	4	5
3	The programme helped to boost food security among the beneficiaries.	1	2	3	4	5
4	NAAIAP programme is a good project that sensitizes farmers on the importance of using adequate farm inputs.	1	2	3	4	5
5	NAAIAP programme sometimes does not normally target the deserving people in the society.	1	2	3	4	5
6	NAAIAP programme should expand on the number of beneficiaries.	1	2	3	4	5

4. Please indicate in the table below the details about use of Fertilizer before and after the NAAIAP programme.

Records of fertilizer used before the NAAIAP Programme					**Records of fertilizer used After the NAAIAP Programme.**				
Bags of CAN used	Bags of DAP used	Acres Under Maize	Yield Per Acre	Total No. of Bags harvested	Bags of CAN used	Bags of DAP used	Acres Under Maize	Yield Per Acre	Total No. of Bags harvested

End

Thank You

Appendix B:

Questionnaire for Farmers under Fertilizer Subsidy Programme

Introduction

This questionnaire is meant to investigate the effect of farm input supply support programme (Subsidy Fertilizer Programme) on farmers' active participation in maize production in Trans-nzoia county. Please fill the questionnaire and submit at the agreed time, anything or item that is not clear can be clarified. All the information filled will not be used for any action against the interviewee and all the information will be treated as confidential and will be used only for the purposes of this survey.

PART A: Background and Socio-Economic Information about the Farmer

Instructions: Please fill the blank places provided with the information requested or tick where appropriate.

1 (a) District… ……..…… (b) Division ……

(c) Location……

(d) Date…….. (e) Mobile No…….

Code……..

2 (a) Farmers age bracket in years (Tick appropriately)

Less than 20 ☐ Between 20 and 39 ☐ Between 40 and 59 ☐

Between 60 and 79 ☐ 80 and above ☐

(b) Gender of the farmer (Tick where applicable)

Male ☐ Female ☐

(c) Marital status of farmer (Tick where applicable)

Single ☐ Married ☐

Divorced ☐ Widowed ☐

3. What is your level of education? (Tick where applicable)

None ☐ Secondary ☐

Primary ☐ College/University ☐

4. Are you in the formal employment? Yes ☐ NO ☐

If your answer is yes where do you work? .....

5. What is the size of your land in acres…….

6. Kindly indicate the acres for the first 5 enterprises (e.g. Maize, Beans, and Livestock etc) in your farm in the table below.

S. No	**Enterprise**	**Acres**
1		
2		
3		
4		
5		

PART B: Information on Fertilizer Subsidy Programme.

1. Have you ever bought the subsidized fertilizer from National Cereal and Produce Board (NCPB) for maize farming since the government started the programme?

Yes ☐ NO. ☐

2. The issues in the table below concern the fertilizer input subsidy programme implemented by the government through the NCPB. Please circle the number on the scale that you agree with according to your opinion or judgment. The rating scale is explained below;

1 = strongly disagree (SD)

2 = Disagree (DA)

3 = Not sure (NS)

4 = Agree (AG)

5 = Strongly Agree (SA).

S. NO.	ISSUES	SD	DA	NS	AG	SA
1	Input subsidy can motivate farmers to produce more maize.	1	2	3	4	5
2	The government should continue with the subsidy programme.	1	2	3	4	5
3	The fertilizer subsidy programme has helped to stabilize the fertilizer prices in the market.	1	2	3	4	5
4	The fertilizers are supposed to be sent early to the nearest NCPB depots before the season starts.	1	2	3	4	5
5	The fertilizer subsidy can lead to increase in quantities of fertilizer bought by farmers.	1	2	3	4	5
6	The fertilizer subsidy can lead to increase in yields of maize,	1	2	3	4	5
7	The fertilizer subsidy has some challenges such as corruption	1	2	3	4	5
8	Most small scale maize still don't benefit fully from the subsidies but large scale farmers.	1	2	3	4	5
9	The programme can increase food security among families	1	2	3	4	5
10	The governments needs to include other farm inputs like pesticides in the programme	1	2	3	4	5
11	The government should continue controlling the access to the fertilizer through MoA	1	2	3	4	5
12	NCPB should open up more depots closer to the farmers to make it easier to get the fertilizer.	1	2	3	4	5
13	High cost of fuel especially diesel is also responsible for high cost of farm inputs and farming	1	2	3	4	5
14	The government should also subsidize the cost of diesel.	1	2	3	4	5
15	Subsidy of farm inputs is not good for the economy of this country.	1	2	3	4	5
16	Sometimes the subsidized fertilizer is sold to private stockists	1	2	3	4	5

3. Where do you have the nearest NCPB store where you get subsidized the fertilizer?

4. How far is the store from your farm in Km……..?

5. How much do you spend to transport one bag of fertilizer from the store to your farm? Ksh……

6. How long does it take you to access the fertilizer from the NCPB stores after the application?

One day ☐ Three days ☐ One week ☐ More than one week ☐

More than two weeks ☐

7. Does the process of acquiring fertilizer involve allot of bureaucracy which affects the programme?

Yes ☐ No. ☐

8. If your answer is yes, where do you experience a lot of inefficiency or difficulties?

Ministry of Agriculture offices. ☐ NCPB offices. ☐ All of the two ☐

9. What are the difficulties you face in the above office(s) you have ticked?

……

10. If you got fertilizer through NCPB, answer the following questions and fill in the tables below;

(a) How much do you normally spend on one acre of maize if you don't buy fertilizer through the NCPB?

Ksh……..

(b) How much did you spend on one acre of maize after buying fertilizer through NCPB?

Ksh……..

c) Please indicate in the table below the details about fertilizer purchase and use before and after the fertilizer subsidy programme through the NCPB.

Table

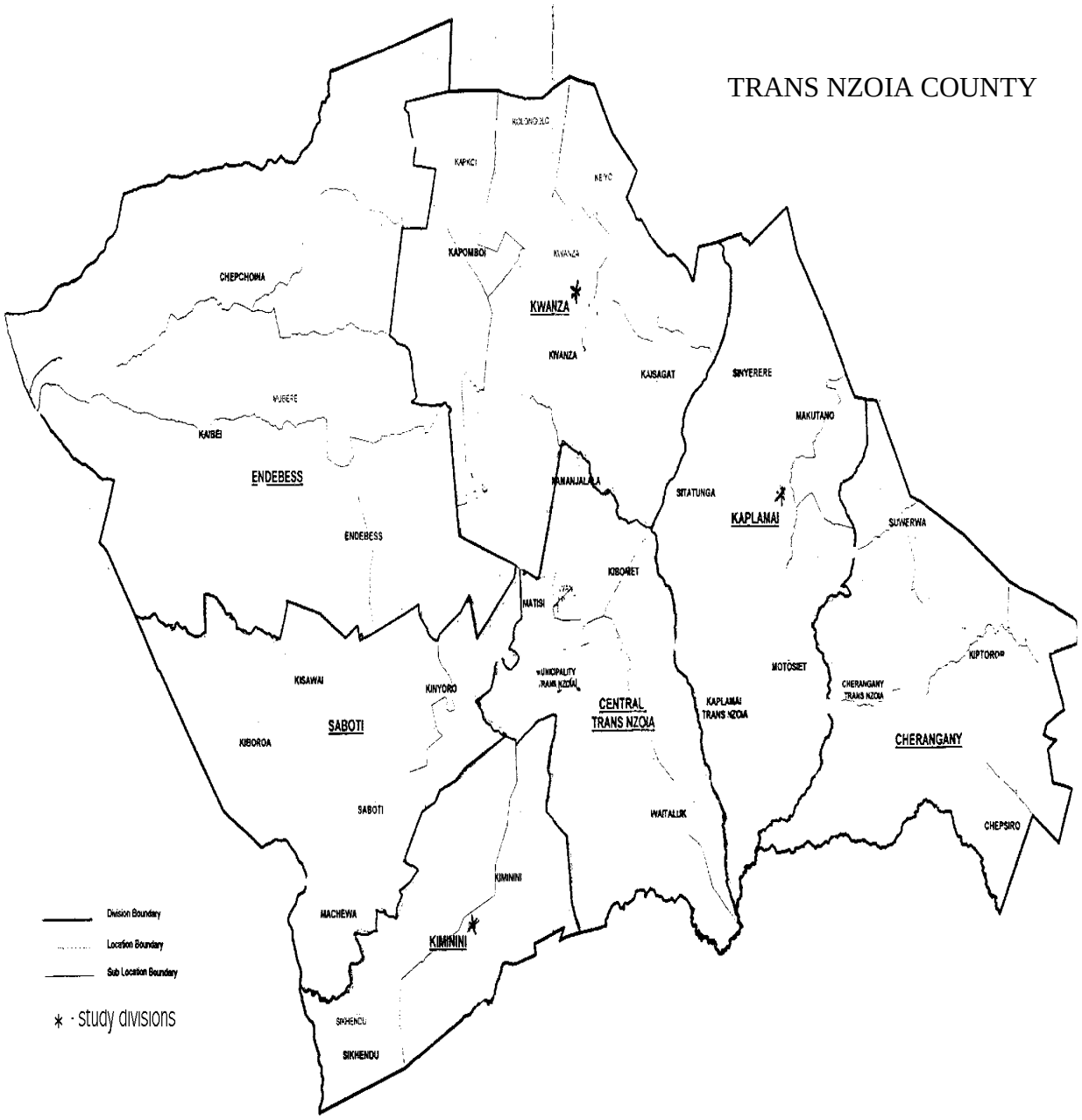
Records of fertilizer used/purchased Before the Fertilizer Subsidy					**Records of fertilizer used/purchased During the Fertilizer subsidy**				
Bags of CAN used	Bags of DAP used	Acres Under Maize	Yield Per Acre	Total No. of Bags harvested	Bags of CAN used	Bags of DAP used	Acres Under Maize	Yield Per Acre	Total No. of Bags harvested

End

Thank You.

Appendix C:

Map of Trans-Nzoia County



Appendix D

Letter of Research Authorization

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471,2241349
254-020-310571,2213123, 2219420
Fax: 254-020-318245,318249
when replying please quote
secretary@ncst.go.ke

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

Our Ref: **NCST/RCD/10/013/2**

Date: **29th January, 2013**

Domnic Mang'ula Asewe
Egerton University
P.O.Box 536-20115
Egerton.

RE: RESEARCH AUTHORIZATION

Following your application dated ***16th January, 2013*** for authority to carry out research on "***Effect of farm input supply support programmes on farmers' participation in maize production in Trans- Nzoia County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Trans-Nzoia County** for a period ending **31st July, *2013*.**

You are advised to report to **the District Commissioners, the District Education Officers and the District Agricultural Officers, Trans-Nzoia County** before embarking on the research project.

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

DR M.K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The District Commissioners
The District Education Officers
The District Agricultural Officers
Trans-Nzoia County.

"The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development".

Appendix E

Research Permit

PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Domnic Mang'ula Asewe
of (Address) Egerton University
P.O.Box 536-20115, Egerton.
has been permitted to conduct research in

Location
District
Trans-Nzoia County

on the topic: Effect of farm input supply support programmes on farmers participation in Maize production in Trans – Nzoia County, Kenya.

for a period ending: 31st July, 2013.

Applicant's Signature

PAGE 3

Research Permit No. *NCST/RCD/10/013/2*
Date of issue *29th January, 2013*
Fee received *KSH. 1,000*

Secretary
National Council for Science &Technology